ENERGY MONITORING

Applications And Products

CR Magnetics provides the tools needed for Energy Management.





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The Professional Energy Monitoring Company®

CR MAGNETICS

ISO 9001:2008 Quality Management System

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About Us

CR Magnetics specializes in Electrical Power Systems Monitoring

CR Magnetics, Inc. has been in operation since 1986, and is centrally located in St. Louis, Missouri, where we maintain a 40,000 square foot manufacturing facility and warehouse. CR Magnetics also maintains manufacturing and sales offices worldwide, including East Asia, Europe, and the Americas.

CR Magnetics, Inc. Corporate Headquarters St. Louis, Missouri

Shenzhen, China Manufacturing Facility

CR Magnetics philosophy is to provide a complete line of products and components that enables our customers to solve the challenges they face in an ever changing competitive environment. With rising energy costs and shrinking margins, maintaining efficiencies of operations, processes, and capital equipment is of utmost concern to today's Industrial and Equipment Engineer. While we strive to provide the most cost effective and sophisticated products available, we also provide expert engineering assistance when our customers are working on tough applications. Our OEM support is also a primary advantage, giving OEM's access to low cost production for custom designs.

Recognizing the need for more products and improved customer support, CR Magnetics, Inc. is now part of the **Khorporate Holdings** family of companies. The Khorporate Holdings companies are respected leaders in their industries for over 40 years. Their expertise in distribution, customer service, and manufacturing will only help CR Magnetics continue to provide top quality products, quickly and at a competitive price. CR Magnetics, Inc. has adopted the **ISO9001:2008** Quality Management System.

Current Ring Released in 1986

Today, CR Magnetics provides a complete line of sensors, transducers, and components needed in today's industry. Our new **Current Mark Indicators and Displays** are further evidence of our continued excellence. Our full line of Analog Transducers, ANSI and Commercial Grade Current Transformers, Medium Voltage Products, Power Meter and General Purpose components provide any user the tools they need to improve any application. Our engineers are ready to answer any questions, and we won't rest until we get the right product for the right job at the right price. Give us a call today, and find out why CR Magnetics are the Professional Energy Monitoring experts.

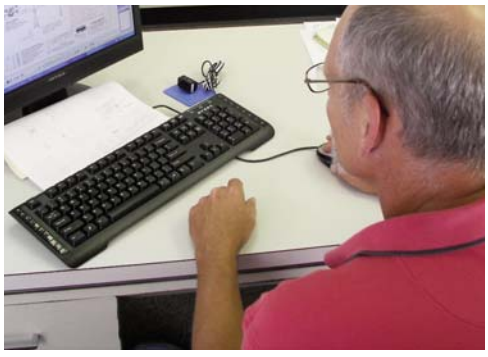
Current Mark Indicators Newest Product Release

CR Magnetics Focus on Service and Technology

CR Magnetics staff includes engineering and technical professionals who bring a century's worth of experience in the electrical monitoring and power measurement industry. This experience provides our customers with solutions in solving the most difficult application challenge.

Our fully **NIST** traceable lab consists of six testing stations, each with laboratory grade closed loop controlled power system references that are used to provide exacting baseline inputs for proper calibration of all our products. These stations can create the identical situation faced in the field by our customers, including any voltage, current, or frequency level. The shape and form of these signals can also be adjusted to provide data on how our products react in these situations. CR Magnetics also maintains the proper power meter testing equipment which is designed to meet the parallellogram method of the **ANSI** grade meters, as well as an engineering based test system to verify absolute phase angle shifts with initial inductance measurement of our sensing transformers. These stations are specifically designed to provide the correct specifications for our products when applied in unique or common applications.

All CR Magnetics parts meet the lead-free and other dangerous chemical requirements of **RoHS**. Our most popular products carry **CE**, **UL**, and **CSA** certifications. Our facilities also include the necessary equipment including high-pot testing, environmental testing, and load testing to be able to provide our customers the information and source they need when exploring custom solutions that require agency approvals. Our experience in working with certified bodies make implementing new and exciting monitoring schemes much easier and quicker.



CR Magnetics staff includes quality monitoring and assurance personnel. These personnel have no other function than to make sure our products are maintained with the highest quality level possible. All quality issues are tabulated from customers, employees, and suppliers. Documentation maintained includes customer complaints, corrective actions, and fully traceable materials from supplier through customer. Statistical process control is utilized in the winding, potting, and calibration areas, controlled by documented setups, and re-verified on a regular basis. All procedures are maintained and referenced in an industry standard quality manual.

DATA STREAM DIGITAL TRANSDUCERS Page 11

The **DATA STREAM** series of digital transducers are some of the industry's most advanced devices to measure and monitor electrical power systems. Available in multi-function and single function designs, these products sense Voltage, Current, Power Factor, Real Watts, VARS, and Frequency in a single compact package. The data is then sent over an RS485 bus to other digital based systems for monitoring and controls. A simple command interface using short ASCII commands tells the device to send its data. Full user control over baud rate, scaling, and addressing is available. An optional Modbus design is also available for industry standard control and data systems. All types of electrical systems can be measured, including single, and 3 phase systems, as well as DC systems.

ANALOG TRANSDUCERS Page 27

CR Magnetics **Analog Transducers** are cost effective devices designed to be building blocks for the designer who needs accurate and stable monitoring of electrical properties. The product line includes Voltage, Current, Power, and Frequency measuring devices. Each product is available with either a process level 0-5VDC output, or a process loop 4-20mA output. Self-powered, loop powered, and supply powered devices are available. Calibration methods include True RMS sensing for noisy or variable frequency, as well as Average Sensing for loads run off utility power. Current sensing is available in split core designs so instrumentation can be added without powering down electrical systems. Products can measure single phase, three phase, and DC systems.

RELAYS AND SWITCHES Page 59

CR Magnetics **Relays and Switches** are engineered components designed to provide electrical power system sensing with a switching action output. These components are available in a wide range of configurations depending on your application needs. Proving go/no go switches, adjustable switches for limit applications, and fully adaptable relay products for safety and lockout protections. CR Magnetics also provides a full line of **AC and DC** level controls for a wide variety of applications including motors, loop alarms, and process monitoring. A wide variety of packaging includes DIN Rail mount, panel mount, and wire mounted versions.

For more advanced switching options
See our DATA STREAM products

CURRENT INDICATORS AND DISPLAYS Page 77

CR Magnetics **Current Indicators** are the recognized industry standard in simple but effective electrical circuit monitoring. These indicators can be used to check the status of AC current carrying conductors, and can provide an easy method to tell the operation of heaters, motors, fans, and other AC electrical equipment without disconnecting power and physically measuring connections and equipment. AC current in a conductor induces the LED to light, indicating the presence of AC current in the conductor. Failure of the LED to indicate suggests open heater elements, broken motor leads, and failed fuses without physically measuring the circuits. Value priced and available in all-in-one and remote indicating packages, these products provide payback by saving downtime and maintenance costs.

Solid Core & Split Core Current Transformers Page 87

CR Magnetics supplies a variety of standard **Solid Core and Split Core Current Transformers** designed for measuring electrical systems. These components provide the building blocks to interface most industry standard and customer designed electrical power monitoring systems and equipment. Our transformer line includes **ANSI and Commercial** grade industry standard parts, as well as **PC Board** mounted designs for custom and OEM controls. We carry an extensive line of Medium Voltage (above 1KV) products for the utility and industrial markets. Also unique to CR Magnetics are our **Power Meter** class of transformers with better than 0.2% accuracy. Finally, a line of **Ground Fault** transformers are available as well that provide accurate measurement of extremely small ground fault currents. Whatever the application, CR Magnetics can provide the exact product to meet industry's continually changing needs. Most products can be used as interfaces with other CR Magnetics products, and are **UL and CSA** approved.

POTENTIAL TRANSFORMERS Page 121

CR Magnetics carries an extensive line of **Potential Transformers** that are used to monitor and measure various levels of AC Voltages. Typically modeled similarly to common power transformers, potential transformers are specially designed to provide accurate input versus output curves over a wide range of loading. Whereas power transformers are typically designed for 70 to 80 percent regulation, potential transformers are desinged for 99% or better regulation.

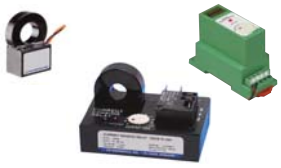
DATA STREAM DIGITAL TRANSDUCERS
SECTION B, PAGE 11

ANALOG TRANSDUCERS
SECTION C, PAGE 27

		CRD5100	CRD4100	CRD4500	CRD6100	CR4100	CR4210	CR4200	CR4400	CR4500	CR4600	CR4800	CR5200	CR5300	CR5400	CR6200	CR6300	CR6600	
AC Current		✔	✔			✔	✔	✔	✔						✔				INPUT
AC Voltage		✔		✔						✔	✔	✔							
AC Power		✔														✔			
AC Energy		✔																	
DC Current					✔								✔		✔				
DC Voltage					✔									✔					
DC Power					✔														
Frequency		✔																✔	
Power Factor		✔															✔		
True RMS		✔	✔	✔		✔				✔					✔				
Average RMS							✔	✔	✔		✔	✔				✔	✔	✔	
Multi-Phase		✔	✔			✔		✔	✔	✔	✔	✔				✔			
Digital		✔	✔	✔	✔														OUTPUT
0-5 VDC/0-10 VDC						✔	✔		✔	✔		✔	✔	✔		✔	✔	✔	
4-20 mA DC						✔		✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	
0 +/- 5 VDC													✔		✔				
0-5 VAC															✔				
12/24 VDC Power		✔	✔	✔	✔	✔			✔	✔		✔	✔	✔	✔	✔	✔	✔	SUPPLY
Loop Powered								✔			✔								
Self Powered							✔												
Din Rail Mount		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
Split Core						✔	✔	✔	✔				✔		✔				
Panel Mount		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	OTHER
UL/CSA Approved						✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
CE Approved		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
RoHS Compliant		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	

CR Magnetics manufactures many custom products for our customers. Whether it is a unique input range or output style, we can handle any special request. If you cant find what you need, call our expert technical staff and we can suggest a solution!

RELAYS & SWITCHES
SECTION D, PAGE 59



CURRENT INDICATORS AND DISPLAYS
SECTION E, PAGE 77

CURRENT TRANSFORMERS
SECTION F, PAGE 87

	CR4395	CR5395	CR7310	CR3395	CR3495	CR9300	CR9400	CR9500	CR9600	CR45	PH-25	PH-31	CR2550	CRM1000	CRM2000	CRM3000	17,18,19	CR8300	CR8750	CR8400	5A SOLID	5A SPLIT	5A MEDIUM	W. PRIMAY	
AC Current	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	INPUT
AC Voltage				✔	✔																				
DC Current		✔		✔	✔																				
DC Voltage				✔	✔																				
Mechanical Relay	✔	✔	✔																						
Solid State Relay				✔	✔																				
LED Indication	✔	✔	✔	✔	✔				✔	✔	✔	✔	✔	✔	✔										
12/24 Vdc Power	✔	✔	✔	✔	✔																				
120 Vac Power	✔	✔	✔																						
240 Vac Power	✔	✔	✔																						
Self Powered						✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
Ground Fault			✔																						OUTPUT
Split Core																									
Splash Proof												✔													
Remote Sensing	✔	✔	✔								✔	✔													
Wire Mount					✔	✔	✔	✔		✔	✔	✔	✔				✔			✔	✔	✔			
Panel Mount	✔	✔	✔	✔	✔				✔	✔	✔	✔	✔	✔	✔	✔	✔				✔		✔	✔	
PCB Board Mount																		✔	✔						SUPPLY
DIN Rail Mount	✔	✔	✔	✔	✔																				
UL/CSA Approved	✔		✔														✔	✔	✔	✔	✔		✔	✔	
..UL Listed													✔	✔	✔										
CE Approved																		✔	✔	✔	✔				
RoHS Compliant	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	OTHER
Reach Compliant													✔	✔	✔										

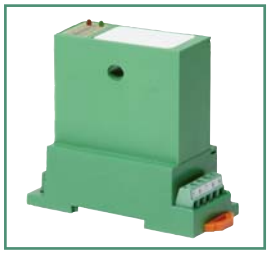
Use CR Magnetics Current and Potential Transformers with any transducer, relay, or indicator product to extend the measuring range of the device. Currents as high as 10,000 Amps and voltages as high as 33KV can be accurately and inexpensively measured.

POTENTIAL TRANSFORMERS
SECTION G, PAGE 121

Selection Guide Notes

DATA STREAM Digital Transducers for Monitoring Current Voltage, Power, Phase Angle and Frequency

The **Data Stream** series provides a digital stream of data that can contain complete electrical properties information including current, voltage, power, phase angle and frequency. Additionally, an energy totalizer can be configured to give total energy calculations. All data is transmitted via an RS485 bus, and a single bus can communicate with multiple devices. MODBUS capable programming is also available.



The **CRD5100** series are designed to provide multifunction measurement of AC power supplies, and output the information over an RS485 bus. These units are available in single element, 3 Phase 3 Wire (DELTA) systems, and 3 Phase 4 Wire (WYE) systems. Output information includes all phase voltages, all line currents, overall power real and imaginary, frequency, and average phase angle. There is also included an resettable energy totalizer function.

The **CRD4100** series are designed to provide AC current value information over an RS485 bus. These units are available in single element, 3 Phase 3 Wire (DELTA) systems, and 3 Phase 4 Wire (WYE) systems. Output information includes all all line/phase currents, depending on system configuration.

The **CRD4500** series are designed to provide AC voltage value information over an RS485 bus. These units are available in single element, 3 Phase 3 Wire (DELTA) systems, and 3 Phase 4 Wire (WYE) systems. Output information includes all all line/phase voltages, depending on system configuration.

The **CRD6100** series are designed to measure DC power systems. Available in single element only, these units will provide current, voltage, and power information across an RS485 Bus.

	CRD5110	CRD5150	CRD5170	CRD4110	CRD4150	CRD4170	CRD4510	CRD4550	CRD4570	CRD6110	
AC Current	✔	✔	✔	✔	✔	✔					APPLICATION
AC Voltage	✔	✔	✔				✔	✔	✔		
DC Current										✔	
DC Voltage										✔	
AC Power	✔	✔	✔								
DC Power										✔	
Phase Angle	✔	✔	✔								
Frequency	✔	✔	✔	✔	✔	✔	✔	✔	✔		
Single Phase	✔			✔			✔			✔	
Three Phase 3 Wire		✔			✔			✔			
Three Phase 4 Wire			✔			✔			✔		METHOD
Power Totalizer	✔	✔	✔							✔	
Panel Mount	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
DIN Rail Mount	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
UL/CSA Approved											AGENCY
CE Approved	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
RoHS Compliant	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	

CRD5110 - ❑ - ❑ 1 ELEMENT, AC MULTIFUNCTION RS485 TRANSDUCER
CRD5150 - ❑ - ❑ 3 PHASE, 3 WIRE, AC MULTIFUNCTION RS485 TRANSDUCER
CRD5170 - ❑ - ❑ 3 PHASE, 4 WIRE, AC MULTIFUNCTION RS485 TRANSDUCER
CRD4110 - ❑ 1 ELEMENT AC CURRENT RS485 TRANSDUCER
CRD4150 - ❑ 2 ELEMENT AC CURRENT RS485 TRANSDUCER
CRD4170 - ❑ 3 ELEMENT AC CURRENT RS485 TRANSDUCER
CRD4510 - ❑ 1 ELEMENT AC VOLTAGE RS485 TRANSDUCER
CRD4550 - ❑ 2 ELEMENT AC VOLTAGE RS485 TRANSDUCER
CRD4570 - ❑ 3 ELEMENT AC VOLTAGE RS485 TRANSDUCER
CRD6110 - ❑ 1 ELEMENT DC CURRENT RS485 TRANSDUCER

150 - 0-150 VAC
300 - 0-300 VAC
(Available up to and including 600VAC)

1 - 0-1 AAC
5 - 0-5 AAC
15 - 0-15 AAC
25 - 0-25 AAC
(Above 25 Amps must use 5 Amp CT)
(See Section G)

Complete your system with 485/232 adapters and Power Supplies

DIN RAIL / PANEL MOUNT

Single Element - .26" Window
150 to 300 VAC
1 to 25 AAC Input Range

Two Element - .26" Window
150 to 300 VAC
1 to 25 AAC Input Range

Three Element - .26" Window
150 to 300 VAC
1 to 25 AAC Input Range

The **CRD5100** Series Data Stream Digital Transducers are designed for complete monitoring of electrical power systems. The digital technology is used to measure voltage, current, power frequency and energy in single and three phase designs. The data is streamed over an RS485 IEEE bus which enables multiple transducers to communicate thru a single master connection. These advanced sensors are ideal for entire plant or zone monitoring. Also, the communication alagorithm can be pre-ordered with ASCII based control or modified MODBUS based control.

Sensing

Voltage, True RMS
Current, True RMS
Active Power, bi-directional
Active Energy, bi-directional
Reactive Power, bi-directional
Reactive Energy, bi-directional
Power Factor
Frequency

Applications

Sub-Metering
Motor Loads
Uninterruptible Power Systems
Remote Monitoring
Load Shedding
Energy Management

Features

35mm DIN Rail or Panel Mount
24 VDC powered
Use with external current transformers
Highest precision available
Connection diagram printed on case

Regulatory Agencies

CE RoHS 2002/95/EC

PART NUMBERS

CRD5110	-		-		1 Element, AC Multifunction RS485 Digital Transducer
CRD5150	-		-		3 Phase, 3-Wire AC Multifunction RS485 Digital Transducer
CRD5170	-		-		3 Phase, 4-Wire AC Multifunction RS485 Digital Transducer

150 - 0-150 VAC
300 - 0-300 VAC
Available up to and including 600 VAC

1 - 0-1 AAC
5 - 0-5 AAC
15 - 0-15 AAC
25 - 0-25 AAC
Above 30 AAC must use 5 amp CT

Note: Add an M at the end for MODBUS
CRD5110-150-5-M

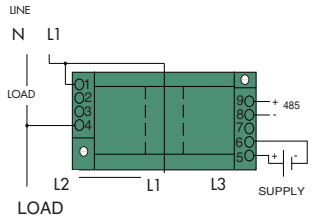
SPECIFICATIONS

Basic Accuracy: 0.5%
Calibration: .....True RMS Sensing
Thermal Drift: .....500 PPM/°C
Operating Temperature$_1$: .....0°C to +60°C
Installation Category: .....CAT II
Vibration Tested To: .....IEC 60068-2-6,1995
Pollution Degree: 2
Insulation Voltage: .....2500 VDC
Altitude: .....2000 meter max
Frequency Range: .....20 Hz - 5 KHz
MTBF: .....Greater than 100K hours
Cleaning: .....Water-dampened cloth
Supply Voltage$_2$: .....24 VDC ±10%

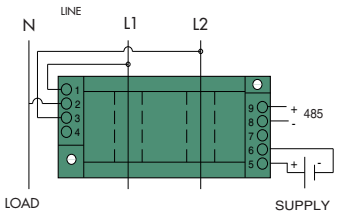
Torque Specifications: .....3.0 inch lbs (0.4Nm)
Response Time: .....250 ms. max. 0-90% FS
Relative Humidity: .....80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Output Resolution: .....16 bit
Transducer fanout on common bus: .....64 max.
Baud Rate$_3$: .....1200, 2400, 4800, 9600,19.2K .bps
A/D Conversion Type: .....4th order Delta Sigma
Device Address$_3$: .....00 to FF
Data Format: .....ASCII
Supply Current:.....Typical 30mA Max 30mA
Weight:.. .....0.5 lbs.

1) RH 5% to 95%, non-condensing 2) 0.4% max. ripple Vpp

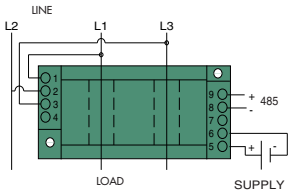
3) Factory default settings: address 01, baud rate 9600, no parity, no flow control, 1 stop bit



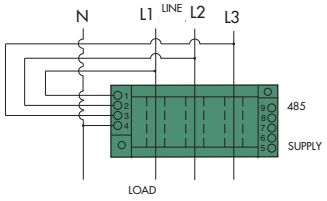
CRD5110 Single Element, 2-Wire



CRD5150 Dual Element, 3-Wire

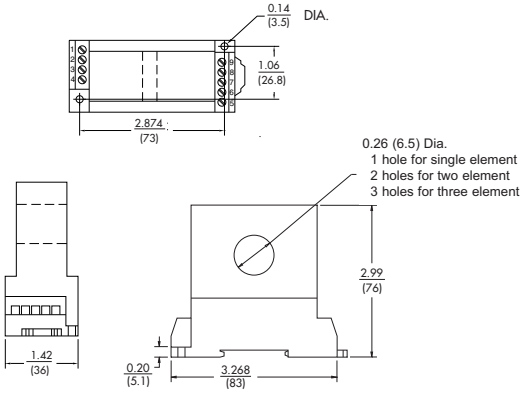


CRD5150 Dual Element, 3-Wire



CRD5170 3 Element, 4-Wire

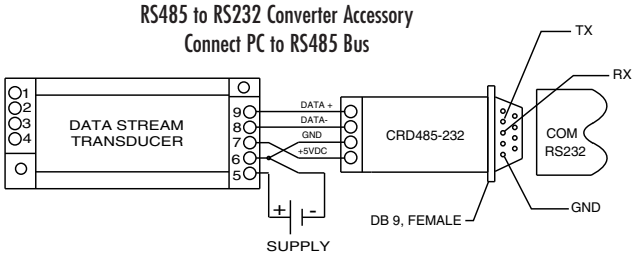
Connection Diagram



OUTLINE DRAWING

CRD485-232

RS485 to RS232 Converter Accessory
Connect PC to RS485 Bus



ASCII Simplified Programming Commands

A simplified data structure is used with only 6 commands required for full control of the transducer. Commands are : Read Transducer Name, Read Configuration, Set Configuration, Read Measurements, Read Energy Totalizer and Clear Energy Totalizer. For illustration, the following commands are used to read data from a CRD5170 3 Phase, 4 Wire Transducer with a device address of 00.

Command Transducer to Read Data: #00A<cr>
Transducers Response: >+[% FS Voltage$_{L1-N}$]+[% FS Current$_{L1}$]+[% FS Voltage$_{L2-N}$]+[% FS Current$_{L2}$]+[% FS Voltage$_{L3-N}$]+[% FS Current$_{L3}$,][+/- % FS Power][+/-% FS VARS][+/-Power Factor][Frequency]<cr>
Command Transducer to Read Energy Totalizer: #00W<cr>
Transducer Responds: 01[+/-KWHr]{\[+/-KVHr][check sum]<cr>
Note: This is for illustration purposes only, See Applications Guides (Section I for complete instructions.

DIN RAIL / PANEL MOUNT

Single Element - .26" Window
1 to 25 AAC Input Range

Two Element - .26" Window
1 to 25 AAC Input Range

Three Element - .26" Window
1 to 25 AAC Input Range

The **CRD4100** Series Data Stream Digital Current Transducers are designed for applications where AC current waveforms are not purely sinusoidal. The digital technology is used to measure voltage, current, power frequency and energy in single and three phase designs. The data is streamed over an RS485 IEEE bus which enables multiple transducers to communicate thru a single master connection. These advanced sensors are ideal for entire plant or zone monitoring. Also, the communication alagorithm can be pre-ordered with ASCII based control or modified MODBUS based control.

Sensing
True RMS Current, Each Phase

Applications
Sub-Metering
Motor Loads
Uninterruptible Power Systems
Remote Monitoring
Load Shedding
Energy Management

Features
35mm DIN Rail or Panel Mount
24 VDC powered
Use with external current transformers
Highest precision available
Connection diagram printed on case

Regulatory Agencies

CE RoHS 2002/95/EC

CR Magnetics has a wide selection of Current and Potential Transformers to extend the range of any part.
See Sections F & G for details.

PART NUMBERS

CRD4110	-		Single Element, AC Current RS485 Digital Transducer
CRD4150	-		Two Element, AC Current RS485 Digital Transducer
CRD4170	-		Three Element, AC Current RS485 Digital Transducer

1 - 0-1 AAC
5 - 0-5 AAC
15 - 0-15 AAC
25 - 0-25 AAC
Above 30 AAC must use 5 amp CT

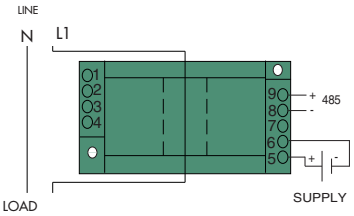
Note: Add an M at the end for MODBUS CRD4110-5-M

SPECIFICATIONS

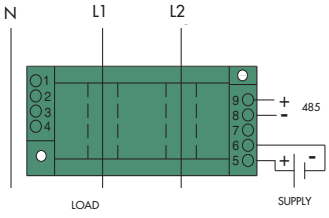
Basic Accuracy: 0.5%
Calibration: .....True RMS Sensing
Thermal Drift: .....500 PPM/°C
Operating Temperature$_1$: .....0°C to +60°C
Installation Category: .....CAT II
Vibration Tested To: .....IEC 60068-2-6,1995
Pollution Degree: 2
Insulation Voltage: .....2500 VDC
Altitude: .....2000 meter max
Frequency Range: .....20 Hz - 5 KHz
MTBF: .....Greater than 100K hours
Cleaning: .....Water-dampened cloth
Supply Voltage$_2$: .....24 VDC ±10%

Torque Specifications: .....3.0 inch lbs (0.4Nm)
Response Time: .....250 ms. max. 0-90% FS
Relative Humidity: .....80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Output Resolution: .....16 bit
Transducer fanout on common bus: .....64 max.
Baud Rate$_3$: .....1200, 2400, 4800, 9600,19.2K .bps
A/D Conversion Type: .....4th order Delta Sigma
Device Address$_3$: .....00 to FF
Data Format: .....ASCII
Supply Current:.....Typical 30mA Max 30mA
Weight:.. .....0.5 lbs.

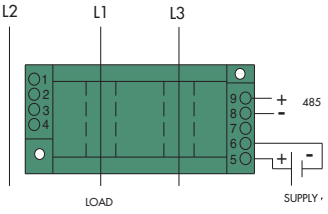
1) RH 5% to 95%, non-condensing 2) 0.4% max. ripple Vpp
3) Factory default settings: address 01, baud rate 9600, no parity, no flow control, 1 stop bit



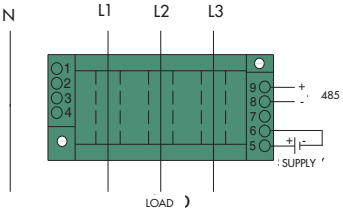
CRD4110 Single Element, 2-Wire



CRD4150 Dual Element, 3-Wire

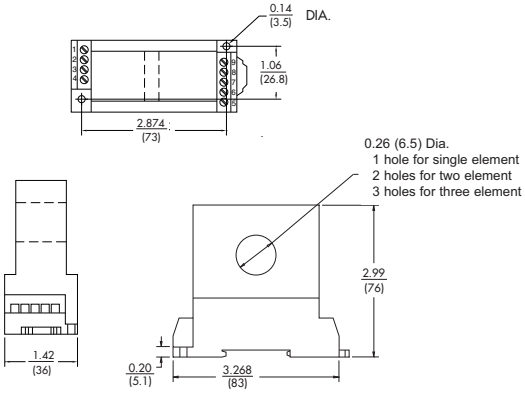


CRD4150 Dual Element, 3-Wire



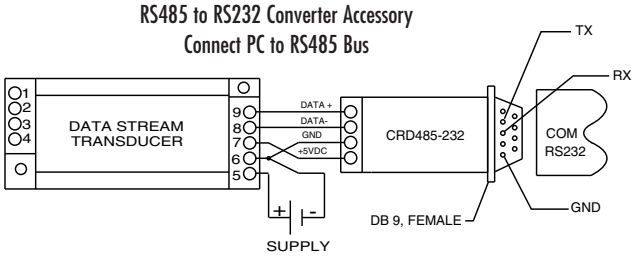
CRD4170 3 Element, 4-Wire

Connection Diagram



OUTLINE DRAWING

CRD485-232
RS485 to RS232 Converter Accessory
Connect PC to RS485 Bus



ASCII Simplified Programming Commands

A simplified data structure is used with only 6 commands required for full control of the transducer. Commands are : Read Transducer Name, Read Configuration, Set Configuration, Read Measurements, Read Energy Totalizer and Clear Energy Totalizer. For illustration, the following commands are used to read data from a CRD5170 3 Phase, 4 Wire Transducer with a device address of 00.

Command Transducer to Read Data: #00A<cr>
Transducers Response: >+[% FS Voltage$_{L1-N}$]+[% FS Current$_{L1}$]+[% FS Voltage$_{L2-N}$]+[% FS Current$_{L2}$]+[% FS Voltage$_{L3-N}$]+[% FS Current$_{L3}$,][+/- % FS Power][+/-% FS VARS][+/-Power Factor][Frequency]<cr>
Command Transducer to Read Energy Totalizer: #00W<cr>
Transducer Responds: 01[+/-KWHr]{\[+/-KVHr][check sum]<cr>
Note: This is for illustration purposes only, See Applications Guides (Section I for complete instructions.

DIN RAIL / PANEL MOUNT

Single Element
150 to 300 VAC Input Range

Two Element
150 to 300 VAC Input Range

Three Element - .26" Window
150 to 300 VAC Input Range

The **CRD4500** Series Data Stream Digital Transducers are designed for applications where AC current waveforms are not purely sinusoidal. The digital technology is used to measure voltage, current, power frequency and energy in single and three phase designs. The data is streamed over an RS485 IEEE bus which enables multiple transducers to communicate thru a single master connection. These advanced sensors are ideal for entire plant or zone monitoring. Also, the communication alagorithm can be pre-ordered with ASCII based control or modified MODBUS based control.

Sensing
True RMS Voltage, Each Phase

Applications
Sub-Metering
Motor Loads
Uninterruptible Power Systems
Remote Monitoring
Load Shedding
Energy Management

Features
35mm DIN Rail or Panel Mount
24 VDC powered
Use with external current transformers
Highest precision available
Connection diagram printed on case

Regulatory Agencies

CE RoHS 2002/95/EC

B

Data Stream

PART NUMBERS			
CRD4510	-		Single Element, AC Voltage RS485 Digital Transducer
CRD4550	-		Two Element, AC Voltage RS485 Digital Transducer
CRD4570	-		Three Element, AC RS485 Digital Transducer

150 - 0-150 VAC
300 - 0-300 VAC
Available up to and including 600 VAC

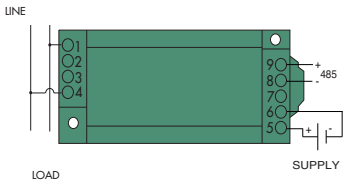
Note: Add an M at the end for MODBUS CRD4510-150-M

SPECIFICATIONS

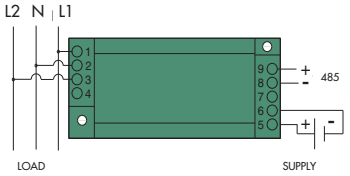
Basic Accuracy: 0.5%
Calibration: .....True RMS Sensing
Thermal Drift: .....500 PPM/°C
Operating Temperature$_1$: .....0°C to +60°C
Installation Category: .....CAT II
Vibration Tested To: .....IEC 60068-2-6,1995
Pollution Degree: 2
Insulation Voltage: .....2500 VDC
Altitude: .....2000 meter max
Frequency Range: .....20 Hz - 5 KHz
MTBF: .....Greater than 100K hours
Cleaning: .....Water-dampened cloth
Supply Voltage$_2$: .....24 VDC ±10%

Torque Specifications: .....3.0 inch lbs (0.4Nm)
Response Time: .....250 ms. max. 0-90% FS
Relative Humidity: .....80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Output Resolution: .....16 bit
Transducer fanout on common bus: .....64 max.
Baud Rate$_3$: .....1200, 2400, 4800, 9600,19.2K .bps
A/D Conversion Type: .....4th order Delta Sigma
Device Address$_3$: .....00 to FF
Data Format: .....ASCII
Supply Current:.....Typical 30mA Max 30mA
Weight:.. .....0.5 lbs.

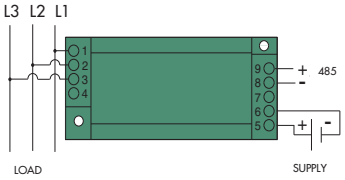
1) RH 5% to 95%, non-condensing 2) 0.4% max. ripple Vpp
3) Factory default settings: address 01, baud rate 9600, no parity, no flow control, 1 stop bit



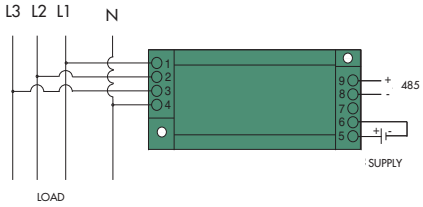
CRD4510 Single Element, 2-Wire



CRD4550 Dual Element, 3-Wire

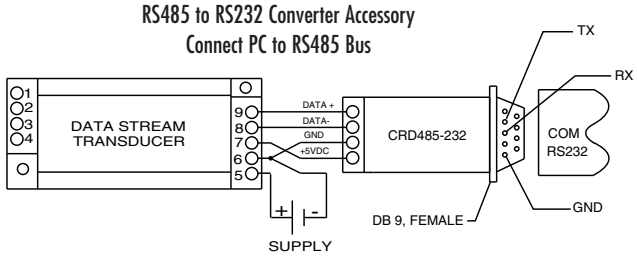


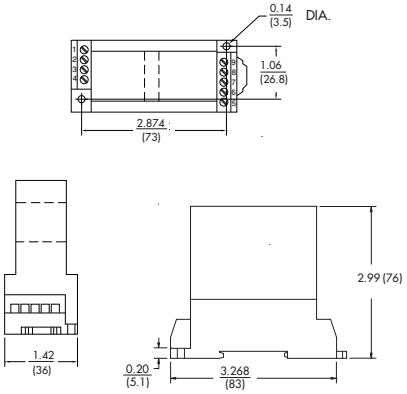
CRD4550 Dual Element, 3-Wire



CRD4570 3 Element, 4-Wire

Connection Diagram





OUTLINE DRAWING

ASCII Simplified Programming Commands

A simplified data structure is used with only 6 commands required for full control of the transducer. Commands are : Read Transducer Name, Read Configuration, Set Configuration, Read Measurements, Read Energy Totalizer and Clear Energy Totalizer. For illustration, the following commands are used to read data from a CRD5170 3 Phase, 4 Wire Transducer with a device address of 00.

Command Transducer to Read Data: #00A<cr>
Transducers Response: >+[% FS Voltage$_{L1-N}$]+[% FS Current$_{L1}$]+[% FS Voltage$_{L2-N}$]+[% FS Current$_{L2}$]+[% FS Voltage$_{L3-N}$]+[% FS Current$_{L3}$][+/- % FS Power][+/-% FS VARS][+/-Power Factor][Frequency]<cr>
Command Transducer to Read Energy Totalizer: #00W<cr>
Transducer Responds: 01[+/-KWHr]{\[+/-KVHr][check sum]<cr>
Note: This is for illustration purposes only, See Applications Guides (Section I for complete instructions.

Single Element
150 to 300 VAC Input Range

Requires External DC Current Transducer
CR5210 0-5VDC Output
(Recommended)

The **CRD6100** Series Data Stream Digital Transducers are designed for applications with DC current and voltage. The digital technology is used to measure voltage, current, power in single phase designs. The data is streamed over an RS485 IEEE bus which enables multiple transducers to communicate thru a single master connection. These advanced sensors are ideal for entire plant or zone monitoring. Also, the communication alagorithm can be pre-ordered with ASCII based control or modified MODBUS based control. **Note:** To calculate current an external DC Current Transducer with 0-5VDC is necessary. Please see our CR5210 Series.

Sensing
DC Voltage
DC Current
DC Power
DC Energy

Applications
Sub-Metering
Motor Loads
Uninterruptible Power Systems
Remote Monitoring
Load Shedding
Energy Management

Features
35mm DIN Rail or Panel Mount
24 VDC powered
Use with external DC Current Transducer
Highest precision available
Connection diagram printed on case

Regulatory Agencies

CE RoHS 2002/95/EC

B

Data Stream

PART NUMBERS

CRD6110	-		-		Single Element, DC Current RS485 Digital Transducer

150 - 0-150 VDC
300 - 0-300 VDC
Available up to and including600 VDC

5 - 0-5 VDC

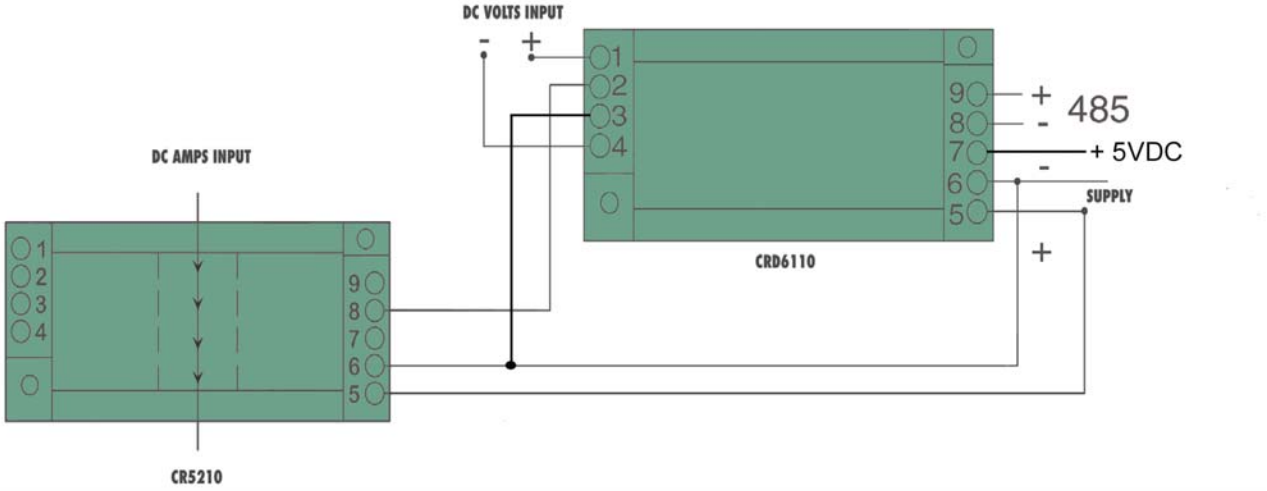
Note: Add an M at the end for MODBUS CRD6110-150-5M

SPECIFICATIONS

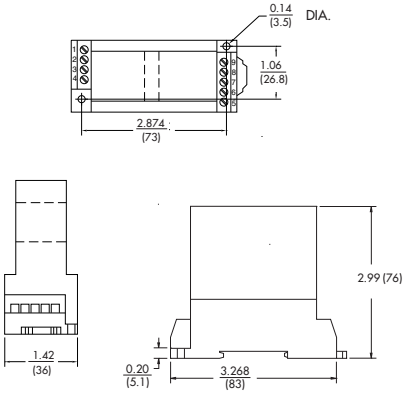
Basic Accuracy: 0.5%
Calibration: .....True RMS Sensing
Thermal Drift: .....500 PPM/°C
Operating Temperature[1]: .....0°C to +60°C
Installation Category: .....CAT II
Vibration Tested To: .....IEC 60068-2-6,1995
Pollution Degree: 2
Insulation Voltage: .....2500 VDC
Altitude: .....2000 meter max
Frequency Range: .....20 Hz - 5 KHz
MTBF: .....Greater than 100K hours
Cleaning: .....Water-dampened cloth
Supply Voltage[2]: .....24 VDC ±10%

Torque Specifications: .....3.0 inch lbs (0.4Nm)
Response Time: .....250 ms. max. 0-90% FS
Relative Humidity: .....80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Output Resolution: .....16 bit
Transducer fanout on common bus: .....64 max.
Baud Rate[3]: .....1200, 2400, 4800, 9600,19.2K .bps
A/D Conversion Type: .....4th order Delta Sigma
Device Address[3]: .....00 to FF
Data Format: .....ASCII
Supply Current:.....Typical 30mA Max 30mA
Weight:.. .....0.5 lbs.

1) RH 5% to 95%, non-condensing 2) 0.4% max. ripple Vpp
3) Factory default settings: address 01, baud rate 9600, no parity, no flow control, 1 stop bit

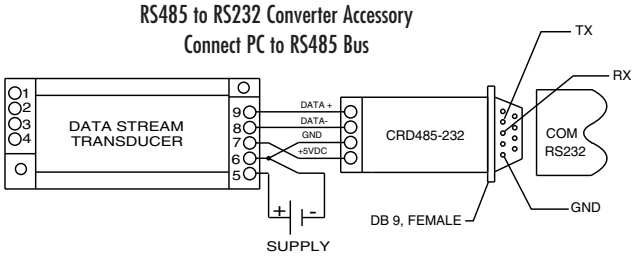


Connection Diagram



OUTLINE DRAWING

CRD485-232
RS485 to RS232 Converter Accessory
Connect PC to RS485 Bus



ASCII Simplified Programming Commands

A simplified data structure is used with only 6 commands required for full control of the transducer. Commands are : Read Transducer Name, Read Configuration, Set Configuration, Read Measurements, Read Energy Totalizer and Clear Energy Totalizer. For illustration, the following commands are used to read data from a CRD5170 3 Phase, 4 Wire Transducer with a device address of 00.

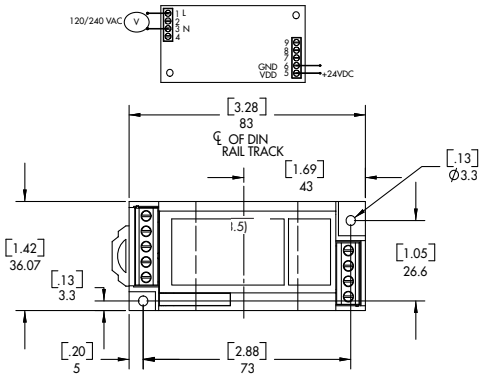
Command Transducer to Read Data: #00A<cr>
Transducers Response: >+[% FS Voltage$_{L1-N}$]+[% FS Current$_{L1}$]+[% FS Voltage$_{L2-N}$]+[% FS Current$_{L2}$]+[% FS Voltage$_{L3-N}$]+[% FS Current$_{L3}$,][+/- % FS Power][+/-% FS VARS][+/-Power Factor][Frequency]<cr>
Command Transducer to Read Energy Totalizer: #00W<cr>
Transducer Responds: 01[+/-KWHr]{\[+/-KVHr][check sum]<cr>
Note: This is for illustration purposes only, See Applications Guides (Section I for complete instructions.

The **CRPS24VDC** Series Power supplies are designed to meter CR Magnetics digital and analog transducers. These switched mode power supplies are compact and efficient with a modern clean looking case.

Features

35mm DIN Rail or Panel Mount
Available with 120Vac/Vdc and 240Vac/Vdc Input
24 VDC Powered
Use with CR Magnetics Transducers
Highest precision available
Connection diagram printed on case

Regulatory Agencies



CONNECTION DIAGRAM

Specifications

Input Voltage	120V,240V±10% 50/60Hz
Rated Output	200mA
Output Voltage	+24VDC
Output Ripple	≤10mV

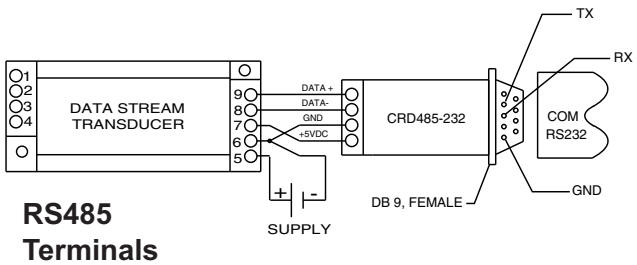
PART NUMBERS

CRPS24VDC	-		Power Supply

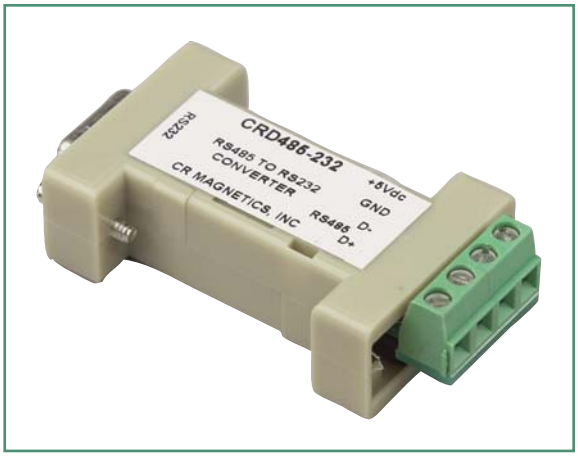
120 - 120V Power Supply
240 - 240V Power Supply
with 24 VDC Output

CRD485-232

RS485 to RS232 Converter Accessory
Connect PC to RS485 Bus



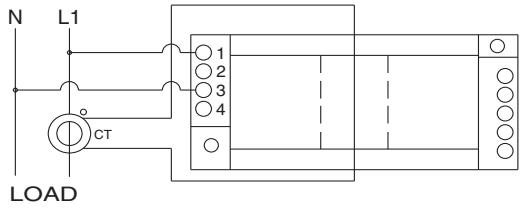
RS485 Terminals



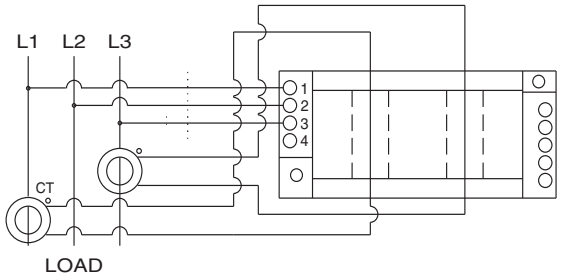
Application Notes

The range of any Data Stream Transducer can be extended with the use of CR Magnetics' ANSI grade current transformers and voltage transformers. In these applications, current transformers step down higher currents into standard 5 Amp AC current inputs, and voltage transformers step down higher voltages into standard 120 VAC inputs. This allows the designer to measure any application with a single transducer.

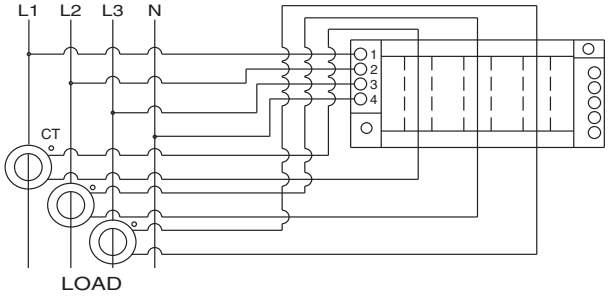
Extending Current Range with Current Transformers



Single Phase

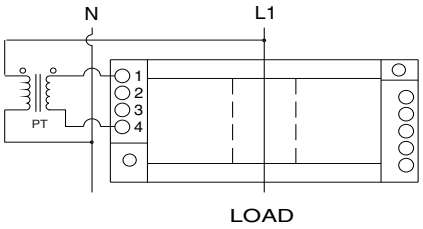


3 Phase 3 Wire

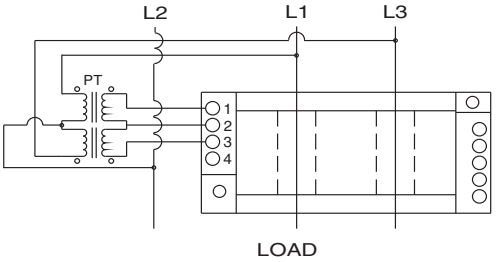


3 Phase 4 Wire

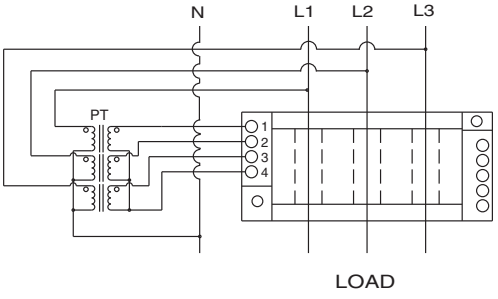
Extending Voltage Range with Voltage Transformers



Single Phase



3 Phase 3 Wire



3 Phase 4 Wire

Programming

Programming of the CR Magnetics DATA STREAM Series is straight forward and easily implemented via user programs or The DATA STREAM Software. The programming language is ASCII based and consists of Commands and Return data.

List of Common Commands

Command	Preamble	Addr	Dir	Data
Read Transducer Name	$	00 to FF	M	N/A
Read All Data	#	00 to FF	A	N/A
Read Energy Totalizer	#	00 to FF	W	N/A
Read Transducer Configuration	$	00 to FF	2	N/A
Set Transducer Configuration	%	00 to FF	N/A	New Addr, Input Range, Baud
Clear Energy Totalizer	&	00 to FF	N/A	Totalizer Period Number

Command Structure

Each command sent to the DATA STREAM has the following structure:

Preamble Addr [Dir] [Data] <cr>

Preamble A single ASCII character which designates type of command.
Addr 2 ASCII characters which selects the address of the transducer.
[Dir] A single ASCII character directive which qualifies the command, not used on all commands.
[Data] A set of ASCII characters required by certain command functions.
<cr> A carriage return must be placed as an end of line character.

Read Transducer Name Command

Preamble $
Addr 00 to FF
Dir M
Data not used

Transducer Correct Response: !
Addr (00 to FF)
Name
<cr>

Transducer Wrong Response: ?
Addr (00 to FF)
<cr>

Example: Send $0AM<cr>
Receive !0A51101205<cr>

In this case, a CRD5110 Single Phase Multifunction transducer with a range of 120 Volts and 5 amps is programmed with the address 0A, and returns its last 4 digits to the system.

Read All Data Command

Preamble #
Addr 00 to FF
Dir **A**
Data not used

Transducer Correct Response:
Voltage % (+/-X.XXXX)
Current % (+/-X.XXXX)
Power % (+/-X.XXXX)
VARS % (+/-X.XXXX)
Power Factor % (+/-X.XXXX)
Frequency (XX.XXX)
<cr>

Transducer Wrong Response: ?
Addr (00 to FF)
<cr>

Example: Given a CRD5110, programmed with a Voltage range of 500VAC RMS, and a Current range of 5 AAC RMS, Address 1B.
Input Voltage =300 VAC RMS,
Input current = 4 AAC RMS,
Power Factor = 1.000 (Pure resistive)
Frequency of 50 Hz.

Send #1BA<cr>
Receive >+0.6000+0.8000+0.4800+0.0000+1.000050.000<cr>

All signed data is returned as a percent of Full Scale.
Thus the formula:

Value = Data(%) X Full Scale

Will give the actual value of the parameter.

For this example:
Voltage = +0.6000% X 500 = 300 VAC RMS
Current = +0.4000% X 5 = 4 AAC RMS
Real Power = +0.4800% X 500 X 5 = 1200 Watts
VARs = +0.0000 X 500 X 5 = 0.0000 Vars
Power Factor = +1.0000 X 100% = 100% PF (purely resistive)

The Frequency Value is the Actual Data:
Frequency = 50.000 Hertz

NOTE: Multifunction units will return Voltage, Current, Power, Vars, Power Factor, and Frequency. Single function units will return only the single function. For Multiphase units, the Voltage and Current Data will be returned in the following order:

3 Phase 3 Wire
$Voltage_{12}$, $Current_1$, $Voltage_{32}$, $Current_3$,
Power, Vars, Power Factor, Frequency

3 Phase 4 wire
$Voltage_1$, $Current_1$, $Voltage_2$, $Current_2$, $Voltage_3$,
$Current_3$, Power, Vars, Power Factor, Frequency.

Programming (continued)

Read Energy Totalizer Command

Preamble	#
Addr	00 to FF
Dir	W
Data	not used

Transducer Correct Response:

Period Counter (00 to FF)
KWHr Data (+/-XXXXXX)
KVHr Data (+/-XXXXXX)
Checksum (XX)
<cr>

Transducer Wrong Response: ?
Addr (00 to FF)
<cr>

Description of Totalizer Function

The energy totalizer function is a method by which the total amount of energy in KwHrs and KVARHrs used over a period of time can be measured. A data location within the program keeps a running total of the amount of energy used. This total starts from zero and begins totalizing the instant power is turned on to the transducer.

Totalizer data is outputted when the Read Energy Totalizer Command is sent to the transducer. At this point, the transducer outputs the amount of energy totaled since the last clear or restart. A counter called the time period counter, keeps track of all instances of requested totalizer data. Thus, at turn on, the period counter is set to zero. After the first read of totalizer data, the counter is incremented by 1 and reads 1. Future requests for data increase the period counter by 1. This counter turns back to zero after 255 counts (FF).

It is important to know that the output data represents the amount of energy used since the last clear or restart. This method makes it very useful for total energy used calculations.

A Clear Totalizer Command function is also provided to reset the totalizer as needed.

The largest period of totalizer data is 1,553.5 Hours with the full scale voltage and current being input to the device. Longer peri ods are possible with lower input voltages and currents.

The data output has gain and function factors that must be included when calculating actual KwHr/KVARHr. The formula is:

Energy = Data Read X Volt Range X Current Range / 3600000

Units are KwHrs and KVARHrs depending on data read.

Please note: Unlike other data read from the transducer, the energy data is transmitted as the ASCII representation of the HEX value. Hence, when the data would return as ASCII "FF", this is equivalent to the decimal value 255.

Checksum data is provided as a verifier of correct data communi cation. The Checksum data is generated by totaling the sum of all byte by byte data, in HEX, sent from the transducer after the Read Energy Totalizer Command is accepted, then taking this HEX value and performing a logical AND with the value FFH, and outputting it. The data is an ASCII representation of the HEX value.

Example: Given a CRD5110, programmed with a Voltage range of 500VAC RMS, and a Current range of 5 AAC RMS, and Address 1B. Input Voltage =300 VAC RMS, Input current = 4 AAC RMS, Power Factor = 1.000 (Pure resistive) and a frequency of 50 Hz. Energy data has not been requested since turn on of the part. The command is sent after the part has been running one hour.

Send #1BW<cr>
Receive >01+0006C0+0000001E<cr>

Time Period = 01H = 1 Decimal
KwHr Data = +0006C0H = 1,728 Decimal
KwHr Actual = 1,728 X 500 X 5 / 3600000 = 1.2 KwHrs
KVARHr Data = +000000H = 0 Decimal
KVARHrs Actual = 0 KVARHrs
Checksum = 1EH

Doing the Check on the Checksum:

3EH+31H+2BH+30H+30H+30H+36H+43H+30H+2BH+30H+30H
+30H+30H+30H+30H = 31EH AND FFH = 1EH

Read Transducer Configuration Command

Preamble	$
Addr	00 to FF
Dir	2
Data	not used

Transducer Correct Response: !
Addr (00 to FF)
Input Range (Always 00)
Baud Rate Code (See Below)
Data Format (Always 01)
<cr>

Transducer Wrong Response: ?
Addr (00 to FF)
<cr>

Example: **Send** $0A2<cr>
Receive !0A000601<cr>

In this case, a CRD5110 Multifunction transducer is programmed with the address 0A. Reading the configuration returns 0A for the address, 00 for the Input Range (fixed), 06 for 9600 bps Baud rate, and 01 for no check sum on standard data (Data Format is fixed).

Baud Rate Codes are as follows:

03 = 1200 bps
04 = 2400 bps
05 = 4800 bps
06 = 9600 bps (Default)
07 = 19200 bps

Set Transducer Configuration Command

Preamble	%
Addr	00 to FF
Dir	not used
Data	New Addr - 00 to FF Input Range - Always Set To 00 Baud Rate - 03 to 07 Data Format - Always Set to 01

Transducer Correct Response: !
New Addr (00 to FF)
<cr>

Transducer Wrong Response: ?
Addr (00 to FF)
<cr>

Example: **Send** %0A0B000701<cr>
Receive !0B<cr>

In this case, a CRD5110 Multifunction transducer is programmed with the address 0A. The command changes the address to 0B, and sets the baud rate to 19,200 bps.

Clear Energy Totalizer Command

Preamble	&
Addr	00 to FF
Dir	not used
Data	Time Period Count

Transducer Correct Response: !
Addr (00 to FF)
<cr>

Transducer Wrong Response: ?
Addr (00 to FF)
<cr>

Description of Clear Totalizer Function

The Clear Energy Totalizer Command is a method by which the internal energy totalizer can be reset to zero. The programmer simply addresses the transducer with the appropriate address, and also sends the correct time period number which will then clear the totalizer to zero.

The correct time period number is the value that was received with the last Read Totalizer Data Command. An incorrect period num ber will result in a command error, and the totalizer will not be cleared. Clearing the totalizer properly does not reset the Time Period Counter. Upon proper totalizer clear, the Time Period Counter will be increased by 1.

Should an invalid Clear Totalizer Command be refused (because of an incorrect address or an incorrect Time Period Number), the totalizer will not be cleared, energy data will continue to be totalized to the sum, and the Time Period Counter will not be incremented.

Example: A CRD5110 with Address 0A needs to have its totalizer cleared. The totalizer data has been read 3 previous times.

Send: &0A04<cr>
Receive: ?0A<cr>

The CRD5110 received an order to clear the totalizer, but an improper time period number was received.

Send: &0A03<cr>
Receive: !0A<cr>

The command was sent properly, as the correct time period number was sent. Please note that the Time Period Counter has been increased by 1, so the next Read Totalizer Command will give a time period number of 4.

Reset to Factory Defaults Command

As an aid to system startup, a Reset to Factory Defaults Command is provided. Since this command resets the transducer to Address 01 and Baud rate 9600 bps, no address is needed to run the command.

NOTE: THIS COMMAND CANNOT BE USED ON NETWORKED TRANSDUCERS. ALL TRANSDUCERS ON THE NET ORK WILL BE RESET, AND THE RESULTING RETURN INFO WILL CAUSE NUMEROUS BUS CONFLICTS.
THIS IS FOR ONE TO ONE CONFIGURATIONS ONLY!!!!

Example: Need to reset a transducer to Factory settings via a RS232 comm port.

Send: @CEAFW<cr>
Receive: !01<cr>

Analog Transducers for Monitoring Current Voltage, Power, Power Factor, and Frequency

CR Magnetics Analog Transducers provide the easy to use tools to monitor any electrical power system, power supply, or electrical load. From simple DC to DC voltage transducers, to complex real and imaginary power transducers, CR Magnetics has the exact input, output, and sensing technology to meet the needs of any electrical power sensing application.

CR Magnetics **Analog Current Transducers** come in a variety of packages and technologies for any current sensing need. The **CR4100 Series** current transducers are True RMS devices for sensing non-sinusoidal AC waveforms. The **CR4400 Series** Average sensing RMS units are designed to measure current derived from utility power busses. The **CR4200 Series** are loop powered 2 wire transducers for average AC sensing. **CR5200 DC Current** transducers are available bipolar or unipolar output designs, and the **CR5400 Series** AC/DC current transducers output a waveform that tracks the input waveform at a calibrated voltage output.

Various outputs are available which include 0-5 VDC, 0-10 VDC, 4-20 mADC.
Custom ranges from 0 to 600 Volts or Amps and anywhere in betwee. Contact factory for details.
CR Magnetics offers single element split core devices that can be installed without interrupting the power system. CR Magnetics also offers monitoring solutions for 3 phase Delta and Wye systems for connected AC power systems.

CR Magnetics has a large offering of **Analog Voltage Transducers** to realize all types of voltage sensing. The **CR4500 Series** are True RMS devices that can accurately measure variable frequencies and waveforms, from single element and 3 phase systems. The **CR4800 Series** are Average RMS devices for measuring sinusoidal utility based power systems. The **CR5300 Series** measure DC voltages. All are available with ±5 VDC, ±10 VDC, 4-20 mADC.

CR Magnetics also provides **Analog Power, Frequency and Power Factor Transducers** to fully measure all characteristics of AC power systems. The **CR6200 Series** Power Transducers can measure Active and Reactive power in single and 3 phase systems. The **CR6600 Series** Frequency transducers provide a way to sense the frequency of an AC voltage signal, and the **CR6300 Series** Power Factor transducers provide a method for sensing the power factor of an AC power system.

Selection Guide

	CR4100	CR4210	CR4200	CR4400	CR4500	CR4600	CR4800	CR5200	CR5300	CR5400	CR6200	CR6300	CR6600	
AC Current	✔	✔	✔	✔										APPLICATION
AC Voltage					✔	✔	✔							
AC Power											✔			
AC Power Factor												✔		
AC Frequency													✔	
3 Phase	✔			✔	✔		✔				✔			
DC Current								✔		✔				
DC Voltage									✔					
Variable Frequency	✔				✔					✔		✔	✔	
Waveform Tracking										✔				
True RMS	✔				✔									METHOD
Average RMS		✔	✔	✔		✔	✔				✔			
Hall Effect								✔		✔				
Magnetic Resonator								✔		✔				
UL/CSA Approved	✔		✔	✔	✔	✔	✔		✔		✔		✔	AGENCY
CE Approved	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
RoHS Compliant	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	

C

Transducers

CR❑❑❑❑ - ❑ - ❑

*** FULL SCALE INPUT RANGE (CR6200 AAC only)**

FULL SCALE INPUT RANGE (all units)

41XX - TRUE RMS CURRENT
421X - SELF POWERED CURRENT
42XX - LOOP-POWERED CURRENT
44XX - AVERAGE RMS CURRENT
45XX - TRUE RMS VOLTAGE
46XX - LOOP POWERED VOLTAGE
48XX - AVERAGE RMS VOLTAGE
52XX - DC CURRENT
53XX - DC VOLTAGE
54XX - AC/DC CURRENT
62XX - AC POWER
63XX - POWER FACTOR
66XX - FREQUENCY

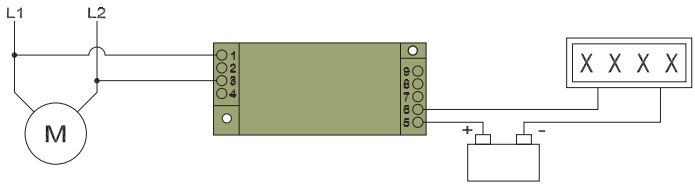
XX10 - SINGLE ELEMENT 0-5 VDC OUTPUT
XX11 - SINGLE ELEMENT 0-10 VDC OUTPUT
XX20 - SINGLE ELEMENT 4-20 mA OUTPUT
XX50 - TWO ELEMENT 0-5 VDC OUTPUT
XX51 - TWO ELEMENT 0-10 VDC OUTPUT
XX60 - TWO ELEMENT 4-20 mA OUTPUT
XX70 - THREE ELEMENT 0-5 VDC OUTPUT
XX71 - THREE ELEMENT 0-10 VDC OUTPUT
XX80 - THREE ELEMENT 4-20 mA OUTPUT

All single element current transducers are available in split core design. Simply put an "S" at the end of the prefix

INDUSTRIAL APPLICATIONS FOR ELECTRICAL TRANSDUCERS

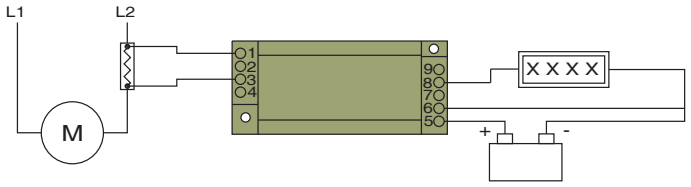
VOLTAGE MONITORING

This illustrates a typical application for monitoring the voltage supply to a motor. The transmitter is attached to the incoming voltage supply leads. Using the CR4600 Series for AC Voltage Sensing, the transmitter output is attached to standard 4-20 mA, loop-powered panel meter. The transmitter may also be attached to a PLC to monitor for over/under voltage and phase loss.



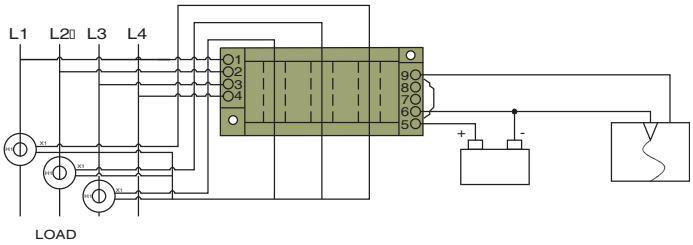
DC CURRENT MONITORING

DC current may be monitored by using the voltage transducer attached to a resistive shunt. The illustration shows a CR5310-.05 transducer with an input range of 0-50 mV attached to a standard 50 mV resistive shunt. The output is attached to a standard 0-5 VDC panel meter.



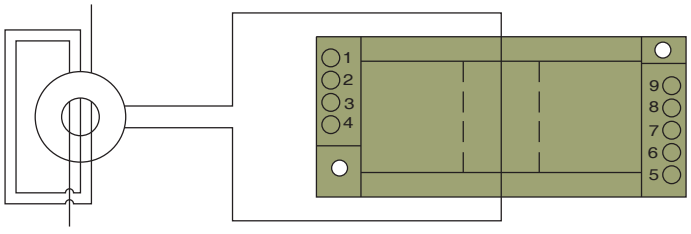
POWER TRANSDUCER

A university campus needs to monitor the power coming into each building and record the results at a central location. The incoming feeds are rated at 480/277, 2000 amps, 3-phase, 4-wire Y. An ANSI Metering Class Current Transformer, part number CR170RL-202, is selected from the CR Magnetics Current Transformer Catalog Section F to convert the full-load current down to 5 Amps for input to the transducer. The voltage legs are connected directly to the transducer.



LOOP-POWERED AC CURRENT TRANSMITTER

Looping the primary current-carrying wire several times through the window opening may change the scaling factor. The "actual" measurement range will be the nameplate rating of the transducer divided by the number of wire passes. For example, the CR4220-30 has a nameplate rating of 0-30 AAC. Three passes of the wire through the window opening will then provide an effective range of 0-10 AAC (30/3).



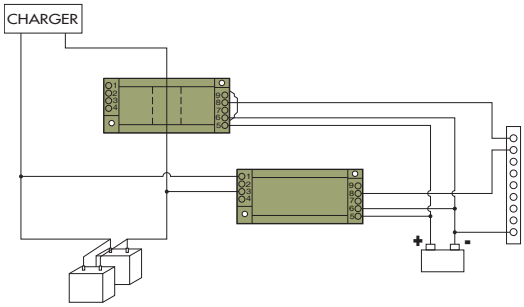
C

Transducers

INDUSTRIAL APPLICATIONS FOR ELECTRICAL TRANSDUCERS

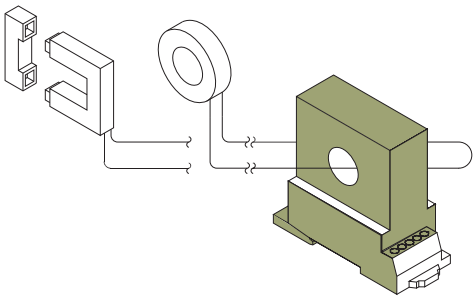
DC POWER MEASUREMENT

A plant manager needs to record the total charge to a bank of batteries. A CR5210 DC Current Transducer is attached to one of the incoming current lead and a CR5310 is attached to the incoming voltage lines. The output from each transducer is attached to a 0-5 VDC analog input module on a PLC. The PLC computates the product of the current and voltage for the total power usage.



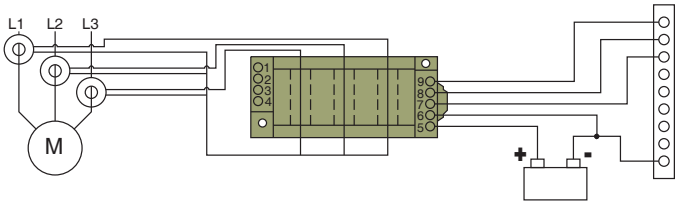
EXTERNAL CURRENT TRANSFORMERS

The transducers and transmitters may be used with an external split-core 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 of the unit. A standard, 5 Amp secondary, commercial grade current transformer would be attached with the secondary leads threaded through the window opening. A transducer or transmitter with a 0-5 Amp input range would be selected. Request CR Magnetics Current Transformer Catalog Section F.



OVER/UNDER CURRENT MONITORING

This illustrates a typical application for monitoring current to a 3-Phase motor. External current transformers attached to each of the three incoming power lines. The secondary leads from each current transformer are routed through the window openings in the CR4170 True RMS Current Transducer. A standard 5 Amp secondary current transformer is recommended to be attached to a transducer rated for 5 Amp input. With the transducer attached to a PLC the over/under current and phase loss conditions can be monitored.



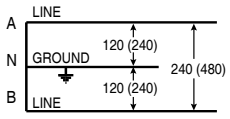
AC MOTOR LOAD CHART

	MOTOR FULL LOAD CURRENTS									MAXIMUM LOCKED ROTOR CURRENTS					
	SINGLE PHASE		3-PHASE A.C. INDUCTION							3 PHASE A.C. INDUCTION					
HP	115V	230V	115V	200V	230V	460V	575V	2300V	4160V	200V	220/230V	440/460V	550/575V	2300V	4160V
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		
1.5	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		
7.5	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	1.33						

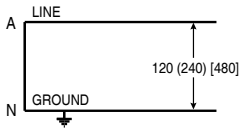
*This information provided as reference only. Consult motor manufacturer and related standards for additional information.

U.S. Standard Voltages

SINGLE-PHASE

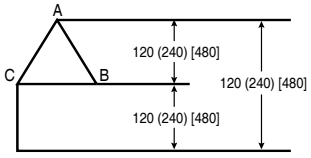


120/240 V, 3 W (240/480 V, 3 W)
THREE-WIRE

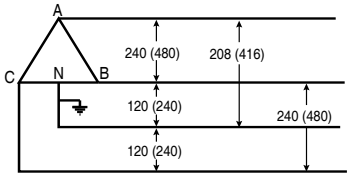


120 V, 2 W (240 V, 2 W) [480 V, 2 W]
TWO-WIRE

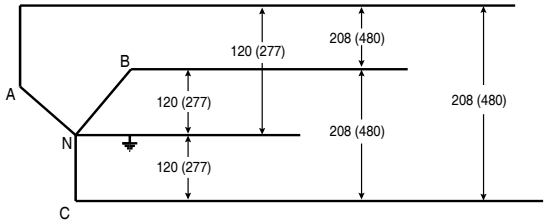
POLYPHASE



120 V, 3 W (240 V, 3 W) [480 V, 3 W]
THREE-PHASE, THREE-WIRE



240/120 V, 4 W (480/240 V, 4 W)
THREE-PHASE, FOUR-WIRE DELTA



208Y/120 V, 4 W (480Y/277 V, 4 W)
THREE-PHASE, FOUR-WIRE WYE

DIN RAIL / PANEL MOUNT, TRUE RMS

Single Element - 0.79" Window
0.5 to 600 AAC Input Range

Two Element - 0 .26" Window
0.5 to 30 AAC Input Range

Three Element - 0.26" Window
0.5 to 30 AAC Input Range

The **CR4100** Series True RMS Current Transducers and Transmitters are designed for applications where AC current waveforms are not purely sinusoidal. More precise and accurate than other transducers, these devices are ideal in chopped wave and phase fired control systems.

Applications

Phase fired controlled heaters
Quickly varying motor loads
Chopped wave form drivers
Harmonic currents

Features

35mm DIN Rail or Panel Mount
Available with 0-5 VDC, 0-10 VDC, 4-20 mADC output
24 VDC powered
Use with external current transformers
Highest precision available
Connection diagram printed on case

Regulatory Agencies

Recognized to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

CE RoHS 2002/95/EC c UL us

E199795

Use a 5 Amp Secondary Current Transformer to extend the ranges of all CR Magnetics Current Transducers

All single phase current transducers are available in split core design. Simply put an "S" at the end of the prefix*
I.E. CR4110S-10
* **Not UL Recognized**

PART NUMBERS			
CR4110(S)	-		Single element with 0 - 5 VDC output (split core design)
CR4111(S)	-		Single element with 0 - 10 VDC output (split core design)
CR4120(S)	-		Single element with 4 - 20 mADC output (split core design)
CR4150	-		Two element with 0 - 5 VDC output **
CR4160	-		Two element with 4 to 20 mADC output **
CR4170	-		Three element with 0 - 5 VDC output **
CR4180	-		Three element with 4 - 20 mADC output **
*Two and three element transducers are available only in ranges of 0.5 to 30 AAC			

[ ] Add suffix for input range

5	-	0- 5 AAC **
10	-	0-10 AAC **
15	-	0-15 AAC **
20	-	0-20 AAC **
25	-	0-25 AAC **
30	-	0-30 AAC **
40	-	0-40 AAC
50	-	0-50 AAC
75	-	0-75 AAC
100	-	0-100 AAC
150	-	0-150 AAC

Ranges available up to and including 600 AAC

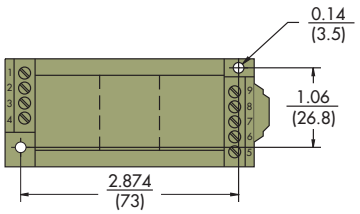
DIN RAIL / PANEL MOUNT, TRUE RMS

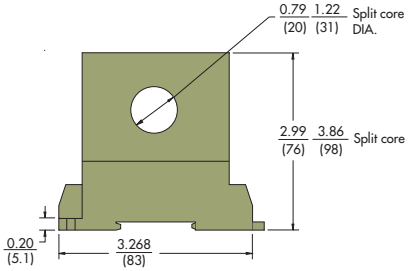
SPECIFICATIONS

Basic Accuracy:..... 0.5%
Linearity:..... 10% to 100% FS
Calibration:..... True RMS Sensing
Thermal Drift:..... 500 PPM/°C
Operating Temperature:..... 0°C to +60°C
Installation Category:..... CAT II
Pollution Degree:..... 2
Insulation Voltage:..... 2500 VDC
Vibration Tested To:.....IEC 60068-2-6,1995
Altitude:..... 2000 meter max.
Frequency Range:..... 20 Hz - 5 KHz
MTBF:..... Greater than 100 K hours
Cleaning:..... Water-dampened cloth
Supply Voltage:..... 24 VDC ± 10%
Output Load:..... 4-20 mADC - 0 to 300 Ω
0-5 VDC - 2K Ω or Greater

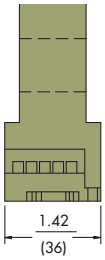
Response Time:..... 250 ms max. 0-90%
FS Relative Humidity:.....80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Torque Specs.:..... 3.0 inch lbs. (0.4Nm)
Weight:.....0.5 lbs.
Supply Current:

CR4110/11.....	Typical 15mA	Max 25mA
CR4120.....	Typical 25mA	Max 40mA
CR4150.....	Typical 25mA	Max 75mA
CR4160.....	Typical 40mA	Max 70mA
CR4170.....	Typical 20mA	Max 60mA
CR4180.....	Typical 55mA	Max 110mA
CR4110S.....	Typical 15mA	Max 25mA
CR4120S.....	Typical 25mA	Max 40mA

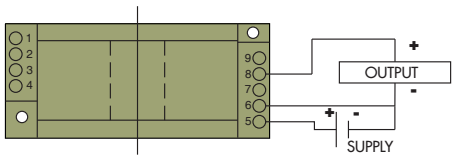




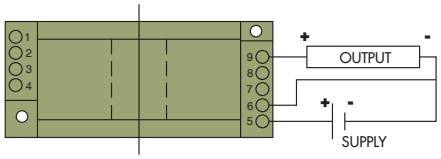
1 hole: 0.79(20) Dia. for CR4110, CR4111& 4120 (shown)
2 holes: 0.26(6.5) Dia. for CR4150 & 4160
3 holes: 0.26(6.5) Dia. for CR4170 & 4180



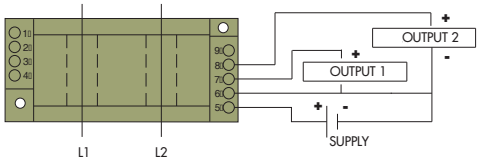
OUTLINE DRAWING



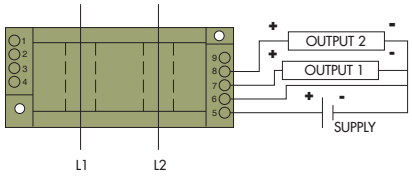
CR4110 One Element 0 - 5 VDC Output
CR4111 One Element 0 - 10 VDC Output



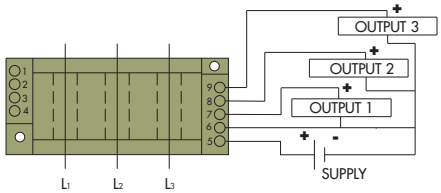
CR4120 One Element 4 - 20 mADC Output



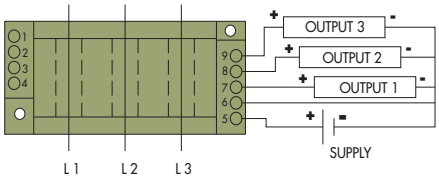
CR4150 Two Element 0 - 5 VDC Output



CR4160 Two Element 4 - 20 mADC Output



CR4170 Three Element 0 - 5 VDC Output



CR4180 Three Element 4 - 20 mADC Output

CONNECTION DIAGRAM

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

The Professional Energy Monitoring Company
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E-mail: sales@crmagnetics.com

DIN RAIL / PANEL MOUNT, AVERAGE RMS

Single Element - .79" Window
0.5 to 600 AAC Input Range

Single Element - 1.22" Window
0.5 to 200 AAC Input Range

The **CR4210** and **CR4211** Series Current Transducers are self powered. These transducers are calibrated to provide a 0-5 VDC and 0-10 VDC signal that is proportional to the average RMS input AC current. Designed for multi-point current sensing, these devices provide excellent features in a value package.

Applications

Multi-point current sensing and control panels
Remote current sensing
Monitor motor faults
Monitor heating elements
Monitor lighting elements

Features

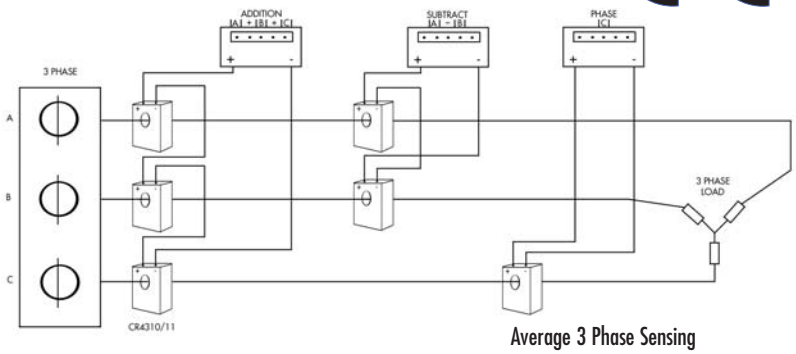
35mm DIN Rail or Panel Mount
Available with 0 - 5 VDC or 0-10 VDC outputs
Self powered, requires no external power source
Use with external current transformers
Low cost
Connection diagram printed on case

Regulatory Agencies

Recognized to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

RoHS 2002/95/EC

c UL us
E199795



Average 3 Phase Sensing

All single phase current transducers are available in split core design. Simply put an "S" at the end of the prefix*
I.E. CR4210S-10
*** Not UL Recognized**

PART NUMBERS			
CR4210(S)	-		Single element with 0 - 5 VDC output (split core design)
CR4211(S)	-		Single element with 0 - 10 VDC output (split core design)*
*CR4210S and CR4211S only available in ranges 20 amps and above			

Add suffix for input range

2	-	0-2 AAC
5	-	0-5 AAC
10	-	0-10 AAC
20	-	0-20 AAC
50	-	0-50 AAC
70	-	0-70 AAC
100	-	0-100 AAC
150	-	0-150 AAC
200	-	0-200 AAC

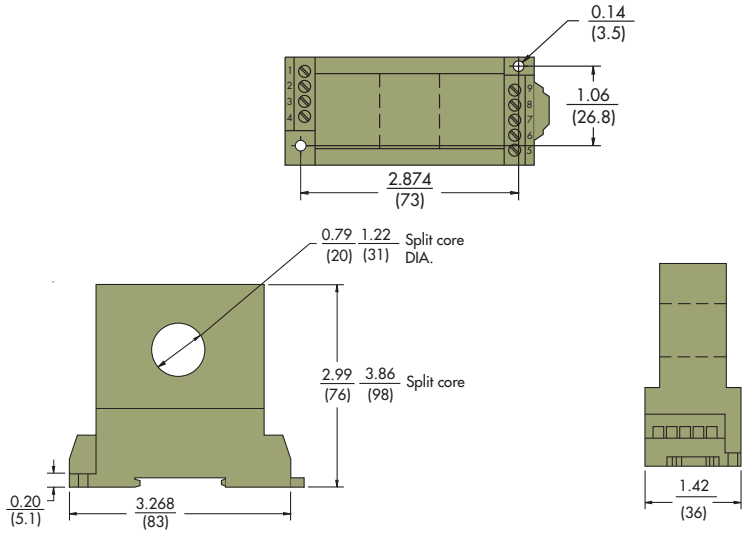
Ranges available up to and including 600 AAC

DIN RAIL / PANEL MOUNT, AVERAGE RMS

SPECIFICATIONS

Basic Accuracy:	0.5%	Cleaning:	Water-dampened cloth
Linearity:	10% to 100% FS	Output Load:	2K Ω or Greater
Thermal Drift:	500 PPM/°C	Response Time:	250 ms max., 0-90%FS
Operating Temperature:	0°C to +60°C	Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Installation Category:	CAT II		
Vibration Tested To:	IEC 60068-2-6,1995		
Pollution Degree:	2	Supply Power:	Self powered (output voltage is obtained from current-sensing conductor)
Insulation Voltage:	2500 VDC		
Altitude:	2000 meter max.		
Frequency Range:	50Hz - 400Hz	Torque Specs.:	3.0 inch lbs. (0.4Nm)
Calibration:	Average Sensing, RMS Calibrated	Weight:	0.5 lbs.
MTBF:	Greater than 100 K Hours		

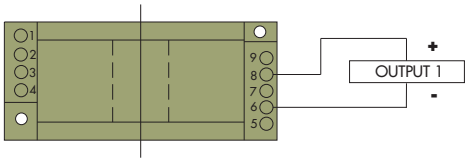
OUTLINE DRAWING



1 hole: 0.79(20) Dia. for CR4210 & 4211 (shown)

CONNECTION DIAGRAM

Request CR Magnetics Low & Medium Voltage Current Transformers Catalog.



CR4210 Single Element 0 - 5 VDC Output
CR4211 Single Element 0 - 10 VDC Output

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

DIN RAIL / PANEL MOUNT, AVERAGE RMS

The **CR4200** Series, Current Transmitters produce a calibrated 4-20 mADC signal that is proportional to the average RMS input AC current. Designed for multi-point current sensing, these devices provide excellent features in a value package. The output signal is generated from a user supplied 24 VDC power supply within the output current loop.

Single Element - .79" Window
0.5 to 50 AAC Input Range

Two Element - .26" Window
0.5 to 30 AAC Input Range

Applications
Multi-point current sensing and control panels
Remote current sensing
Monitor motor faults
Monitor heating elements
Monitor lighting elements

Features
Relatively low cost
35mm DIN rail or panel mount
High Accuracy
Easy wiring
Interfaces with most commercially available instrumentation
Connection diagram printed on case

Regulatory Agencies
Recognized to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

CE

RoHS 2002/95/EC

c UL us
E199795

CR Magnetics has a wide selection of current transformers to extend the range of any part. Contact factory for more information.

All single phase current transducers are available in split core design. Simply put an "S" at the end of the prefix*
I.E. CR4220S-10
* **Not UL Recognized**

Add suffix for input range

PART NUMBERS			
CR4220(S)	-		Single element with 4 - 20 mADC output (split core design)
CR4260	-		Two element with 4 - 20 mADC output*
*Two element transducers are only available in ranges of 0.5 to 30 AAC			

5	-	0- 5 AAC
10	-	0-10 AAC
15	-	0-15 AAC
20	-	0-20 AAC
25	-	0-25 AAC
30	-	0-30 AAC
40	-	0-40 AAC
50	-	0-50 AAC

Ranges available up to and including 600 AAC

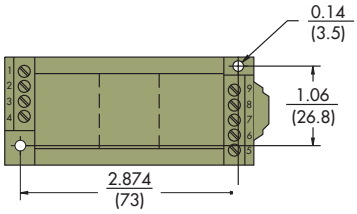
DIN RAIL / PANEL MOUNT, AVERAGE RMS

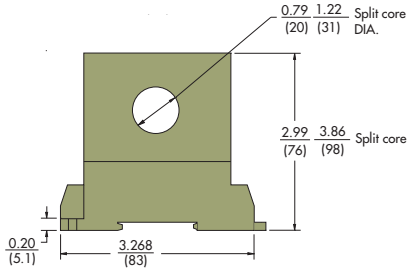
SPECIFICATIONS

Basic Accuracy:	0.5%	MTBF:	Greater than 100 K
Linearity:	10% to 100% FS	HoursCleaning:	Water-dampened cloth
Thermal Drift:	500 PPM/°C	Output Load:	0 to 300 Ω
Operating Temperature:	0°C to +60°C	Response Time:	250 ms max., 0-90%FS
Installation Category:	CAT II	Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Vibration Tested To:	IEC 60068-2-6,1995		
Pollution Degree:	2		
Insulation Voltage:	2500 VDC	Supply Power:	Loop Voltage 24 Vdc
Altitude:	2000 meter max.	Compliance Voltage:	16 to 28 Vdc
Frequency Range:	50Hz - 400 Hz	Torque Specs.:	3.0 inch lbs. (0.4Nm)
Calibration:	Average Sensing, RMS Calibrated	Weight:	0.5 lbs.

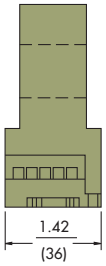
C

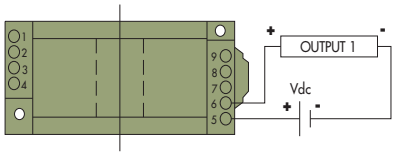
Transducers



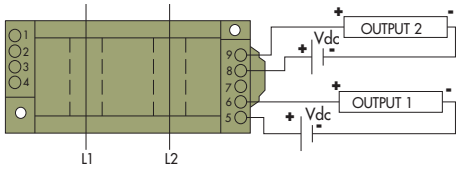


1 hole: 0.79(20) Dia. for CR4220 (shown)
2 holes: 0.26(6.5) Dia. for CR4260

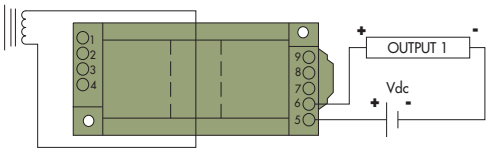




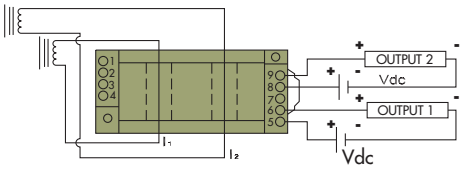
CR4220
One Element - 4 - 20 mADC Output



CR4260
Two Element 4 - 20 mADC Output



CR4220
One Element with external current transformer *



CR4260
Two Element with external current transformer *

*Request CR Magnetics Low & Medium Voltage Current Transformers Catalog.

OUTLINE DRAWING

CONNECTION DIAGRAM

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

Average RMS AC Current Transducer

DIN RAIL / PANEL MOUNT, AVERAGE RMS

Single Element - .79" Window
0.5 to 600 AAC Input Range

Two Element - .26" Window
0.5 to 30 AAC Input Range

Three Element - .26" Window
0.5 to 30 AAC Input Range

The **CR4400** Series, Current Transducers and Transmitters are designed to produce a DC output signal that is proportional to the average RMS input AC current. Designed for multi-point current sensing, these devices provide excellent features in a value package .

Applications

Multi-point current sensing and control panels
Monitor motor faults
Monitor heating elements
Monitor lighting elements

Features

Low cost
DIN rail or panel mount
Available with 0-5 VDC, 0-10VDC or 4-20 mADC output
High Accuracy
Interfaces with most commercially available instrumentation
Connection diagram printed on case

Regulatory Agencies

Recognized to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

RoHS 2002/95/EC

c UL us
E199795

Use a 5 Amp Secondary Current Transformer to extend the ranges of all CR Magnetics Current Transducers

All single phase current transducers are available in split core design. Simply put an "S" at the end of the prefix*
I.E. CR4410S-10
* **Not UL Recognized**

PART NUMBERS			
CR4410(S)	-		Single element with 0 - 5 VDC output (split core design)
CR4411(S)	-		Single element with 0 - 10 VDC output (split core design)*
CR4420(S)	-		Single element with 4 - 20 mADC output (split core design)
CR4450	-		Two element with 0 - 5 VDC output *
CR4460	-		Two element with 4 to 20 mADC output *
CR4470	-		Three element with 0 - 5 VDC output *
CR4480	-		Three element with 4 - 20 mADC output *

Two and three element transducers are available only in ranges of 0.5 to 30 AAC
* CR4411 Series not UL Recognized

Add suffix for input range

5	-	0-5 AAC
10	-	0-10 AAC
15	-	0-15 AAC
20	-	0-20 AAC
25	-	0-25 AAC
30	-	0-30 AAC
40	-	0-40 AAC
50	-	0-50 AAC
75	-	0-75 AAC
100	-	0-100 AAC
150	-	0-150 AAC

Ranges available up to and including 600 AAC

DIN RAIL / PANEL MOUNT, AVERAGE RMS

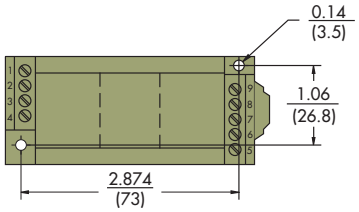
SPECIFICATIONS

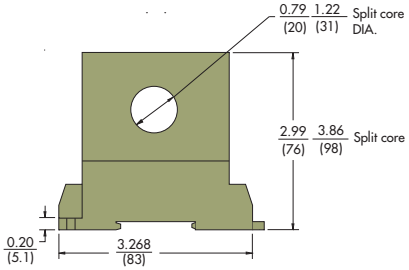
Basic Accuracy:	0.5%
Linearity:	10% to 100% FS
Thermal Drift:	500 PPM/°C
Operating Temperature:	0°C to +60°C
Installation Category:	CAT II
Vibration Tested To:	IEC 60068-2-6,1995
Pollution Degree:	2
Response Time:	250 ms max., 0-90% FS
MTBF:	Greater than 100 K hours
Altitude:	2000 meter max.
Calibration:	Average Sensing, RMS Calibrated
Insulation Voltage:	2500 VDC
Power Source:	24 VDC
Frequency Range:	50Hz - 400Hz
Output Load:	4-20 mADC - 0 to 300 Ω
	0-5 VDC - 2K Ω or Greater
Cleaning:	Water-dampened cloth
Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Supply Voltage:	24 VDC ±10%

Supply Current:

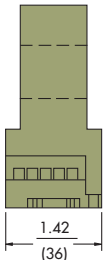
CR4410/11	Typical 20mA	Max 40mA
CR4420	Typical 25mA	Max 45mA
CR4450	Typical 20mA	Max 75mA
CR4460	Typical 40mA	Max 90mA
CR4470	Typical 25mA	Max 110mA
CR4480	Typical 55mA	Max 120mA
CR4410S	Typical ---mA	Max -----mA
CR4420S	Typical ---mA	Max -----mA

Torque Specs.: 3.0 inch lbs. (0.4Nm)
Weight: 0.5 lbs.

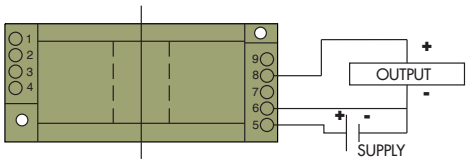




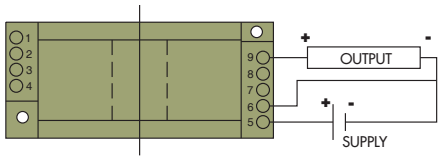
1 hole: 0.79(20) Dia. for CR4410 & 4420 (shown)
2 holes: 0.26(6.5) Dia. for CR4450 & 4460
3 holes: 0.26(6.5) Dia. for CR4470 & 4480



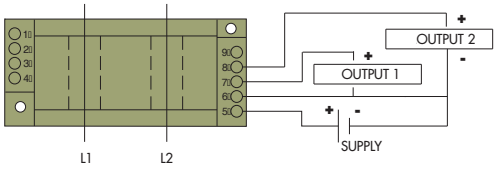
OUTLINE DRAWING



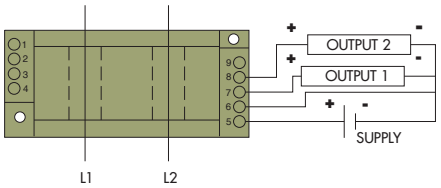
CR4410 One Element 0 - 5 VDC Output
CR4411 One Element 0 - 10 VDC Output



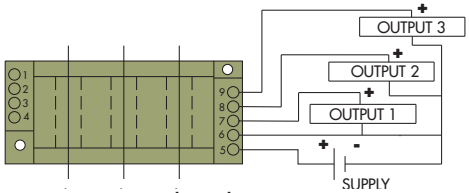
CR4420 One Element 4 - 20 mADC Output



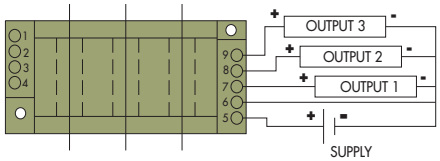
CR4450 Two Element 0 - 5 VDC Output



CR4460 Two Element 4 - 20 mADC Output



CR4470 Three Element 0 - 5 VDC Output



CR4480 Three Element 4 - 20 mADC Output

*Request CR Magnetics Low & Medium Voltage Current Transformers Catalog.

CONNECTION DIAGRAM

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

DIN RAIL / PANEL MOUNT, TRUE RMS

The **CR4500** Series, True RMS Voltage Transducers and Transmitters are designed for applications where AC voltage waveforms are not purely sinusoidal. More precise and accurate than other devices, these units are ideal in chopped wave and phase fired control systems.

Single Element
1.0 to 600 VAC Input Range

Three Element
1.0 to 600 VAC Input Range

Applications
Phase fired controlled devices
Quickly varying voltage supplies
Chopped waveform drivers
Harmonic voltages

Features
35mm DIN rail mount or panel mount
Available with 0-5 VDC, 0-10VDC or 4-20 mADC output
24 VDC powered
Highest precision available
Outputs isolated from inputs
Connection diagram printed on case

Regulatory Agencies
Recognized to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

RoHS 2002/95/EC

c UL us
E199795

Add suffix for input range

PART NUMBERS			
CR4510	-		Single element with 0 - 5 VDC output
CR4511	-		Single element with 0 - 10 VDC output
CR4520	-		Single element with 4 - 20 mADC output
CR4550	-		3-Phase 3-Wire with 0 to 5 VDC Output
CR4560	-		3-Phase 3-Wire with 4 - 20 mADC Output
CR4570	-		3-Phase 4-Wire with 0 to 5 VDC Output
CR4580	-		3-Phase 4-Wire with 4 - 20 mADC Output

50 - 0-50 VAC
150 - 0-150 VAC
250 - 0-250 VAC
500 - 0-500 VAC

Ranges available up to and including 600 VAC

*** UL Recognized up to 300 Vac**

CR Magnetics has a wide selection of Potential Transformers to extend the range of any part. Contact factory for more information.

The Professional Energy Monitoring Company
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ISO 9001:2008 Quality Management System
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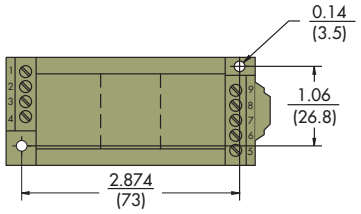
Web: http://www.crmagnetics.com

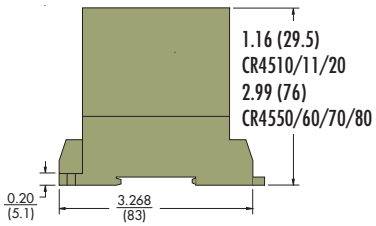
E-mail: sales@crmagnetics.com

DIN RAIL / PANEL MOUNT, TRUE RMS

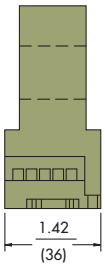
SPECIFICATIONS

Basic Accuracy:	0.5%	MTBF:	Greater than 100 K hours
Linearity:	10% to 100% FS	Output Load:	4-20 mADC - 0 to 300 Ω
Calibration:	True RMS Sensing		0-5 VDC - 2K Ω or Greater
Thermal Drift:	500 PPM/°C	Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Operating Temperature:	0°C to +60°C		
Installation Category:	CAT II		
Vibration Tested To:	IEC 60068-2-6,1995	Supply Current:	
Pollution Degree:	2	CR4510:	Typical 15mA Max 25mA
Response Time:	250 ms	CR4520:	Typical 25mA Max 40mA
Altitude:	2000 meter max.	CR4550/70:	Typical 20mA Max 60mA
Insulation Voltage:	2500 Vdc	CR4560/80:	Typical 55mA Max 110mA
Supply Voltage:	24 Vdc ±10%	Torque Specs.:	3.0 inch lbs. (0.4Nm)
Frequency Range:	20 Hz - 5 KHz	Weight:	0.5 lbs.
Cleaning:	Water-dampened cloth		

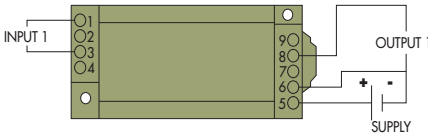




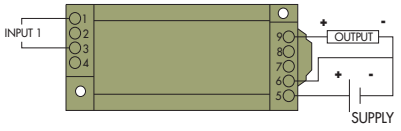
Dimensions for Models CR4550, CR4560, CR4570, CR4580 (shown)



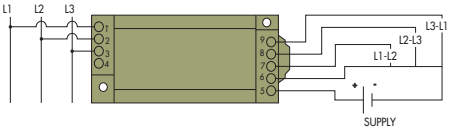
OUTLINE DRAWING



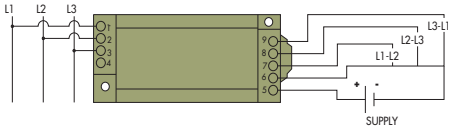
CR4510 Single Phase - 0 - 5 VDC Output
CR4511 Single Phase - 0 - 10 VDC Output



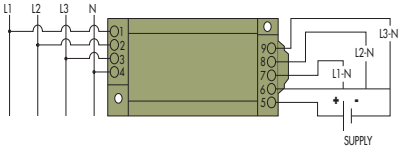
CR4520 Single Phase - 4 - 20 mADC Output



CR4550 3 Phase, 3 Wire - 0 - 5 VDC Output



CR4560 3 Phase, 3 Wire - 4-20 mADC Output



CR4570 3 Phase, 4 Wire - 0 - 5 VDC Output

CR4580 3 Phase, 4 Wire - 4 - 20 mADC Output

USE CR MAGNETICS LOW AND MEDIUM VOLTAGE POTENTIAL TRANSFORMERS (SECTION G)

CONNECTION DIAGRAM

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

DIN RAIL / PANEL MOUNT, AVERAGE RMS

The **CR4600** Series, Loop-Powered AC Voltage Transmitters are designed to provide a 4 - 20 mADC output that is proportional to the average RMS AC voltage input. These devices are best suited for general applications, such as fixed frequency voltage supplies.

Single Element Transmitter
1.0 to 600 VAC Input Range

Two Element Transmitter
1.0 to 600 VAC Input Range

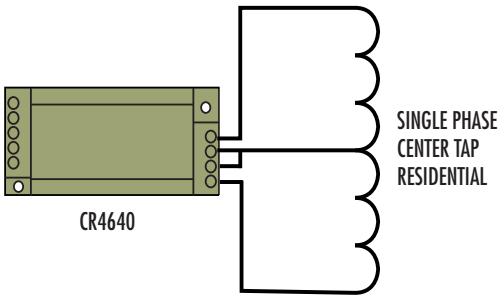
CR Magnetics has a wide selection of Potential Transformers to extend the range of any part. Contact factory for more information.

Applications
Monitor for over/under voltage
Sense phase loss
Power monitoring
Multi-point instrumentation needs

Features
35mm DIN Rail or Panel Mount
Outputs isolated from inputs
One or two element
Connection diagram printed on case

Regulatory Agencies
Recognized to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

E199795



TYPICAL APPICATION
RESIDENTIAL POWER

PART NUMBERS			
CR4620	-		Single element with 4 - 20 mADC output
CR4640	-		Two element with 4 - 20 mADC output

Add suffix for input range

50	-	0-50 VAC
150	-	0-150 VAC
250	-	0-250 VAC
500	-	0-500 VAC *

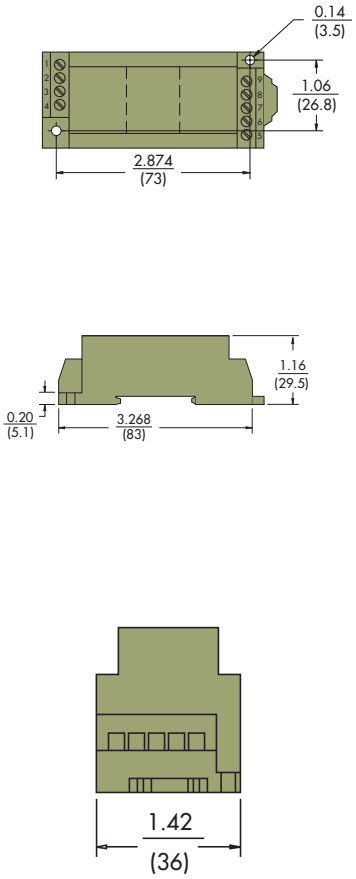
Ranges available up to and including 600 VAC

*** UL Recognized up to 300 Vac**

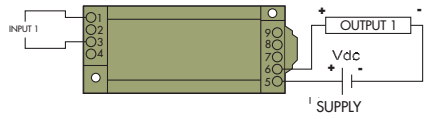
DIN RAIL / PANEL MOUNT, AVERAGE RMS

SPECIFICATIONS

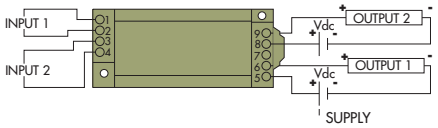
Basic Accuracy:	0.5%	Cleaning:	Water-dampened cloth
Calibration:	Average Sensing, RMS Calibrated	MTBF:	Greater than 100 K hours
Thermal Drift:	500 PPM/°C	Frequency Range:	20 Hz - 400 Hz
Operating Temperature:	0°C to + 60°C	Typical Load:	0 - 300 Ω @ 24 VDC
Installation Category:	CAT II	Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Vibration Tested To:	IEC 60068-2-6,1995		
Pollution Degree:	2		
Response Time:	250 ms	Torque Specs.:	3.0 inch lbs. (0.4Nm)
Altitude:	2000 meter max.	Weight:	0.5 lbs.
Insulation Voltage:	2500 VDC		
Supply Voltage:	Loop Powered 24 Vdc ±10%		



OUTLINE DRAWING

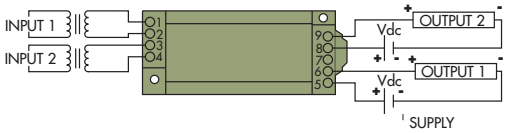


CR4620 One Element4 - 20 mADC Output



CR4640 Two Element 4 - 20 mADC Output

CR4620 One Element with External Voltage Transformers * *



CR4640 Two Element with External Voltage Transformers * *

CONNECTION DIAGRAM

* * USE CR MAGNETICS LOW AND MEDIUM VOLTAGE POTENTIAL TRANSFORMERS (SECTION G)

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

Average RMS AC Voltage Transducer

DIN RAIL / PANEL MOUNT, AVERAGE RMS

The **CR4800** Series, Average RMS Voltage Transducers and Transmitters are designed to provide a DC output proportional to the AC voltage input. These devices are best suited for general applications, such as fixed frequency voltage supplies.

Single Element
1.0 to 600 VAC Input Range

Three Element
1.0 to 600 VAC Input Range

Applications
Monitor Motor Faults
Monitor Heating Elements
Monitor Lighting Elements
Remote Voltage Sensing

Features
35mm DIN Rail or Panel Mount
Available with 0-5 Vdc, 0-10Vdc or 4-20 mADC outputs
24 Vdc powered
Outputs isolated from inputs
Connection diagram printed on case

Regulatory Agencies
Recognized to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

CE RoHS 2002/95/EC c UL us

E199795

Add suffix for input range

PART NUMBERS			
CR4810	-		Single Element with 0 - 5 VDC output
CR4811	-		Single Element with 0 - 10 VDC output*
CR4820	-		Single Element with 4 - 20 mADC output
CR4850	-		3-Element 3-Wire with 0 to 5 VDC Output
CR4860	-		3-Element 3-Wire with 4 - 20 mADC Output
CR4870	-		3-Element 4-Wire with 0 to 5 VDC Output
CR4880	-		3-Element 4-Wire with 4 - 20 mADC Output
* CR4811 Series not UL Recognized			

50 - 0-50 VAC
150 - 0-150 VAC
250 - 0-250 VAC
500 - 0-500 VAC
Ranges available up to and including 600 VAC

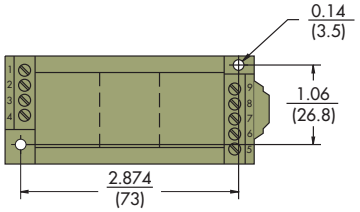
*** UL Recognized up to 300 Vac**

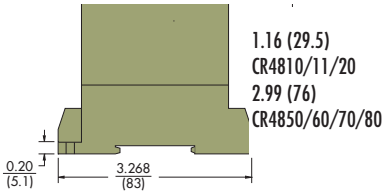
CR Magnetics has a wide selection of Potential Transformersto extend the range of any part. See Section G for details.

DIN RAIL / PANEL MOUNT, AVERAGE RMS

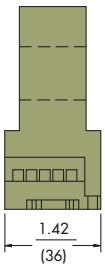
SPECIFICATIONS

Basic Accuracy:	0.5%	Output Load:	4-20 mADC - 0 to 300 Ω
Linearity:	10% to 100% FS		0-5 VDC - 2K Ω or Greater
Calibration:	Average Sensing, RMS Calibrated	Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Thermal Drift:	500 PPM/°C		
Operating Temperature:	0°C to +60°C		
Installation Category:	CAT II	Supply Current:	
Vibration Tested To:	IEC 60068-2-6,1995	CR4810:	Typical 15mA Max 30mA
Pollution Degree:	2	CR4820:	Typical 23mA Max 45mA
Response Time:	250 ms	CR4850:	Typical 25mA Max 110mA
Altitude:	2000 meter max.	CR4860:	Typical 55mA Max 110mA
Insulation Voltage:	2500 Vdc	CR4870:	Typical 25mA Max 110mA
Supply Voltage:	24 Vdc ±10%	CR4880:	Typical 55mA Max 110mA
Frequency Range:	20 Hz - 400 Hz	Torque Specs.:	3.0 inch lbs. (0.4Nm)
Cleaning:	Water-dampened cloth	Weight:	0.5 lbs.
MTBF:	Greater than 100 K hours		

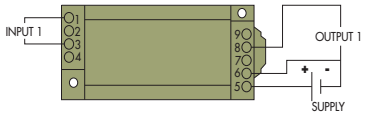




Dimensions for Models CR4850, 4860, 4870, 4880 (shown)

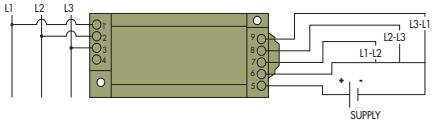


OUTLINE DRAWING

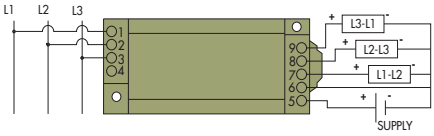


CR4810 Single Element - 0 - 5 VDC Output

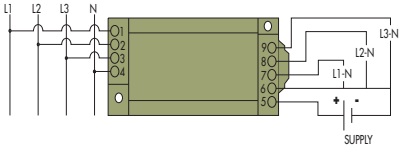
CR4820 Single Element - 4-20 mA DC Output



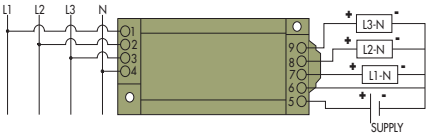
CR4850 3 Element, 3 Wire - 0 - 5 VDC Output



CR4860 3 Element, 3 Wire - 4-20 mA DC Output



CR4870 3 Element, 4 Wire - 0 - 5 VDC Output



CR4880 3 Element, 4 Wire - 4 - 20 mA DC Output

USE CR MAGNETICS LOW AND MEDIUM VOLTAGE POTENTIAL TRANSFORMERS (SECTION G)

CONNECTION DIAGRAM

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

DIN RAIL / PANEL MOUNT, RMS

Single Element - .79" Window
0.1 to 600 ADC Input Range

Single Element - 1.2" Window
20 to 600 ADC Input Range

The **CR5200** Series, DC Current Transducers are designed to provide a DC signal which is proportional to a DC sensed current. These devices are designed for direct current only, targeting them towards general and daily applications. The ranges 2 to 10 Amp utilize an advanced Magnetic Modulator technology and the ranges 20 amps and above utilize Hall Effect technology.

Applications
Battery chargers and systems
DC motor drives
Power supply management
Mobile applications

Features
Closed loop sensing for accuracy
35mm DIN rail or panel mount
Available with ±5 VDC, ±10 VDC or 4 - 20 mADC outputs
Non-contact DC current sensing
Connection diagram printed on case

Regulatory Agencies
Constructed to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

RoHS 2002/95/EC

Contact Factory for Custom ±5 VDC, ±10 VDC or 4 - 20 mADC Output Options

All single phase current transducers are available in split core design. Simply put an "S" at the end of the prefix* I.E. CR5210S-30

Add suffix for input range

PART NUMBERS			
CR5210(S)	▪		Single Element with ± 5 VDC output (split core design)
CR5211(S)	▪		Single Element with ± 10 VDC output (split core design)
CR5220(S)	▪		Single Element with 4 - 20 mADC output (split core design)
NOTE: DC Split Core Transducers Available in 20 Amps and Higher			
NOTE: CR5200 Series is available with 12V Power Supply. Use same application as 24V Power Supply. Example Part Number: CR5210-300-12V			

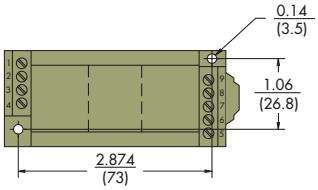
2	-	0-2 ADC
5	-	0-5 ADC
10	-	0-10 ADC
20	-	0-20 ADC
30	-	0-30 ADC
50	-	0-50 ADC
75	-	0-75 ADC
100	-	0-100 ADC
150	-	0-150 ADC
300	-	0-300 ADC

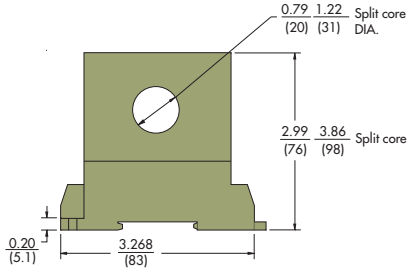
Ranges available up to and including 600 ADC

DIN RAIL / PANEL MOUNT, RMS

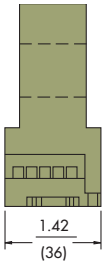
SPECIFICATIONS

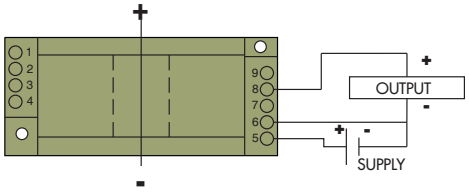
Basic Accuracy:	1.0 %	MTBF:	Greater than 100 K hours
Linearity:	10% to 100% FS	Output Load:	4-20 mADC - 0 to 300 Ω
Thermal Drift:	500 PPM/°C		0-5 VDC - 2K Ω or Greater
Operating Temperature:	0°C to +50°C	Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Installation Category:	CAT II		
Vibration Tested To:	IEC 60068-2-6,1995		
Pollution Degree:	2	Supply Current:	
Response Time:	250 ms	CR5210:	Typical 35mA Max 40mA
Altitude:	2000 meter max.	CR5210S:	Typical 30mA Max 35mA
Insulation Voltage:	2500 VDC	CR5220:	Typical 60mA Max 100mA
Supply Voltage:	24 VDC ±10%	CR5220S:	Typical 40mA Max 50mA
Frequency Range:	DC Only	Torque Specs.:	3.0 inch lbs. (0.4Nm)
Cleaning:	Water-dampened cloth	Weight:	0.5 lbs.



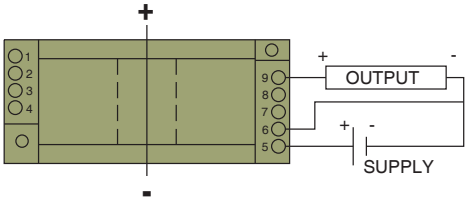


1 hole: 0.79(20) Dia. for CR5210 & 5220 (shown)





CR5210 5 VDC Output
CR5211 10 VDC Output



CR5220 4 - 20 mADC Output

OUTLINE DRAWING

CONNECTION DIAGRAM

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

DIN RAIL / PANEL MOUNT, RMS

Single Element
0.1 - 600 VDC Input Range

The **CR5300** Series, DC Voltage Transducers and Transmitters, are designed to provide an output DC signal that is proportional to the input DC voltage. These devices are especially suited for applications with a current shunt to monitor DC current.

Applications
Power Supply over/under sensing
Battery chargers and systems
Mobile applications
Power sensing

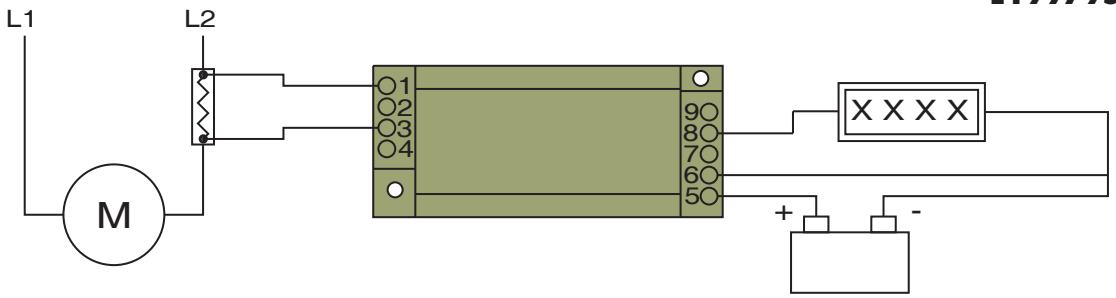
Features
Output isolated from input
Available with 0-5 VDC, 0-10 VDC or 4 - 20 mADC outputs
35mm DIN rail or panel mount
Connection diagram printed on case

Regulatory Agencies
Recognized to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

If you need a relay output, use a **CR3395**.
See Section for Details.

E199795

CR5310 with Resistor Application is shown below (optional).



Add suffix for input range

PART NUMBERS			
CR5310	▪		Single Element with ± 5 VDC output
CR5311	▪		Single Element with ± 10 VDC output
CR5320	▪		Single Element with 4 - 20 mADC output

NOTE: CR5300 Series is available with 12V Power Supply. Use same application as 24V Power Supply.
Example Part Number: CR5310-300-12V

1 - 0-1 VDC
5 - 0-5 VDC
10 - 0-10 VDC
50 - 0-50 VDC
150 - 0-150 VDC
200 - 0-200 VDC

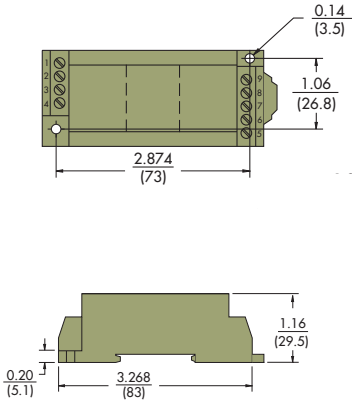
Ranges available up to and including 600 VDC

*** UL Recognized up to 300 Vdc**

DIN RAIL / PANEL MOUNT, RMS

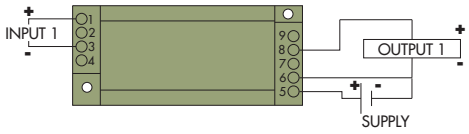
SPECIFICATIONS

Basic Accuracy:	1.0 %	Supply Voltage:	24 VDC ±10%
Linearity:	10% to 100% FS	Frequency Range:	DC only
Thermal Drift:	500 PPM/°C	Output Load:	4-20 mADC - 0 to 300 Ω
Operating Temperature:	0°C to +50°C		0-5 VDC - 2K Ω or Greater
Installation Category:	CAT II	Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Vibration Tested To:	IEC 60068-2-6,1995		
Pollution Degree:	2		
Altitude:	2000 meter max.	Supply Current:	
Response Time:	250 ms. max.	CR5310:	Typical 35mA Max 40mA
Insulation Voltage:	2500 VDC	CR5320:	Typical 35mA Max 40mA
Cleaning:	Water-dampened cloth	Torque Specs.:	3.0 inch lbs. (0.4Nm)
		Weight:	0.5 lbs.

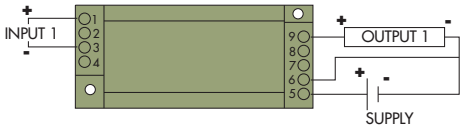


Dimensions for All CR5300 Series (shown)

OUTLINE DRAWING



CR5310 5 VDC Output
CR5311 10 VDC Output



CR5320 4 - 20 mADC Output

CONNECTION DIAGRAM

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

DIN RAIL / PANEL MOUNT, TRACING OUTPUT

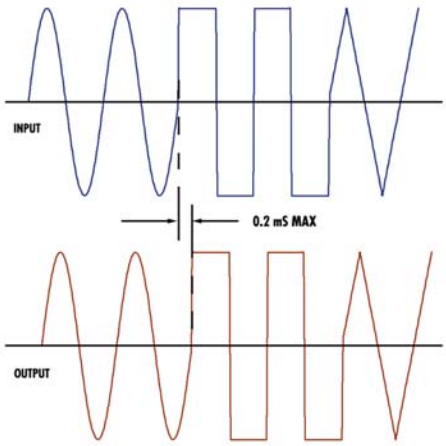
The **CR5400** Series, AC/DC Hall Effect Current Transducers, are designed to provide a bipolar output that proportionally reflects (traces) the waveform of the input current. These devices are specifically targeted to be used in applications where multi-mode current sensing is required.

Single Element - .79" Window
20 TO 600 AAC/DC Input Range

Applications
Inverter and multi-frequency drives
Multi-mode ground paths carrying both AC and DC signals
Feed back loop building block

Features
Output isolated from input
Non-contact current sensing
35mm DIN Rail or Panel Mount
Connection diagram printed on case

Regulatory Agencies
Constructed to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1



TYPICAL TRACKING FUNCTION

All single phase current transducers are available in split core design. Simply put an "S" at the end of the prefix*
I.E. CR5410S-30

Add suffix for input range

PART NUMBERS			
CR5410(S)	▪		Single Element with ± 5 VAC/DC output (split core design)
CR5411(S)	▪		Single Element with ± 10 VAC/DC output (split core design)
NOTE: AC/DC Split Core Transducers Available in 20 Amps and Higher			

20 - ±20 AAC/ADC
30 - ±30 AAC/ADC
50 - ±50 AAC/ADC
75 - ±75 AAC/ADC
100 - ±100 AAC/ADC
150 - ±150 AAC/ADC
300 - ±300 AAC/ADC
Ranges available up to and including 600 AAC/ADC

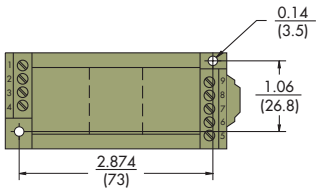
The Professional Energy Monitoring Company
CR MAGNETICS
ISO 9001:2008 Quality Management System
3500 Scarlet Oak Blvd. St. Louis MO USA 63122 V: 636-343-8518 F: 636-343-5119
Web: http://www.crmagnetics.com

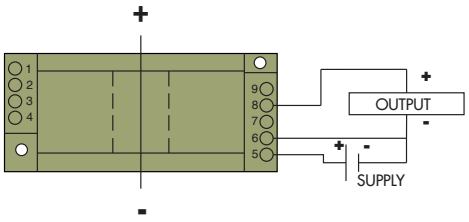
E-mail: sales@crmagnetics.com

DIN RAIL / PANEL MOUNT, TRACING OUTPUT

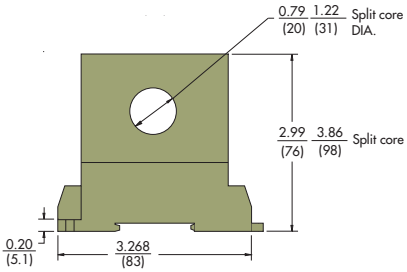
SPECIFICATIONS

Basic Accuracy:	1.0 %	Frequency Range:	DC to 4 KHz
Linearity:	10% to 100% FS	Output:	±5 Vac/DC or ±10 Vac/DC
Thermal Drift:	500 PPM/°C	Output Load:	2 K Ω or greater
Operating Temperature:	0°C to +50°C	Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Installation Category:	CAT II		
Vibration Tested To:	IEC 60068-2-6,1995	Supply Current:	
Pollution Degree:	2	CR5410:	Typical 35mA Max 40mA
Altitude:	2000 meter max.	CR5410S:	Typical 30mA Max 35mA
Insulation Voltage:	2500 VDC	Torque Specs.:	3.0 inch lbs. (0.4Nm)
Cleaning:	Water-dampened cloth	Weight:	0.5 lbs.
MTBF:	Greater than 100K hours		
Supply Voltage:	24 VDC ±10%		

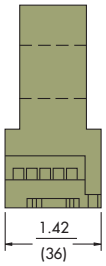




CR5410 ±5 VAC/VDC Output
CR5411 ±10 VAC/VDC Output



1 hole: 0.79(20) Dia. for CR5410 (shown)



OUTLINE DRAWING

CONNECTION DIAGRAM

Power Supply

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

DIN RAIL / PANEL MOUNT, ACTIVE / REACTIVE

CR6210 CR6211
CR6220 CR6221

CR6230 CR6231
CR6240 CR6241

CR6250 CR6251
CR6260 CR6261

CR Magnetics has a wide selection of Current and Potential Transformers to extend the range of any part.

The **CR6200** Series, Power Transducers and Transmitters are designed to provide a controlled output that is proportional to the average power. These devices are specifically targeted to provide an efficient solution to most power sensing needs. Units are designed for operation in systems with sinusoidal voltage and current wave forms.

Applications

Energy Management
Motor Efficiency
Multi-point power sensing
Remote power sensing over long distances

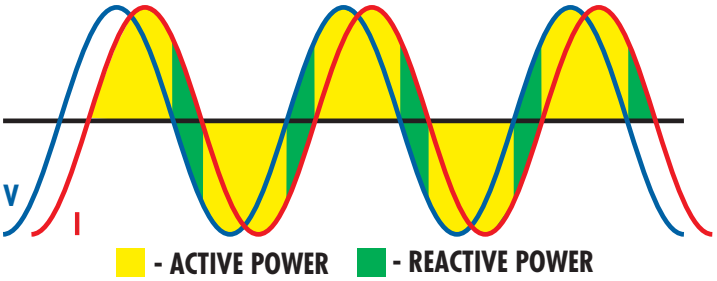
Features

35mm DIN Rail or Panel Mount
Ranges available for any power sensing need
Active and Reactive power sensing
0 - 5 VDC and 4 - 20 mADC outputs
Connection diagram printed on case

Regulatory Agencies

Recognized to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

E199795



POWER TRANSDUCERS CAN BE ORDERED
TO MEASURE ACTIVE OR REACTIVE POWER

DIN RAIL / PANEL MOUNT, ACTIVE / REACTIVE

Add suffix for input range

PART NUMBERS					
CR6210	-		-		1 Phase, Active Power with 0 - 5 VDC Output
CR6211	-		-		1 Phase, Reactive Power with 0 - 5 VDC Output
CR6220	-		-		1 Phase, Active Power with 4 - 20 mADC Output
CR6221	-		-		1 Phase, Reactive Power with 4 - 20 mADC Output
CR6230	-		-		3-Phase, 3-Wire, Active Power with 0 - 5 VDC Output
CR6231	-		-		3-Phase, 3-Wire, Reactive Power with 0 - 5 VDC Output
CR6240	-		-		3-Phase, 3-Wire, Active Power with 4 - 20 mADC Output
CR6241	-		-		3-Phase, 3-Wire, Reactive Power with 4 - 20 mADC Output
CR6250	-		-		3-Phase, 4-Wire, Active Power with 0 - 5 VDC Output
CR6251	-		-		3-Phase, 4-Wire, Reactive Power with 0 - 5 VDC Output
CR6260	-		-		3-Phase, 4-Wire, Active Power with 4 - 20 mADC Output
CR6261	-		-		3-Phase, 4-Wire, Reactive Power with 4 - 20 mADC Output

[ ] - [ ]

150 - 0-150 VAC
250 - 0-250 VAC
500 - 0-500 VAC *
Custom ranges available
* not UL recognized

5 - 0-5 AAC
25 - 0-25 AAC

CR Magnetics has a wide selection of current and potential transformers to extend the range of any part.

SPECIFICATIONS

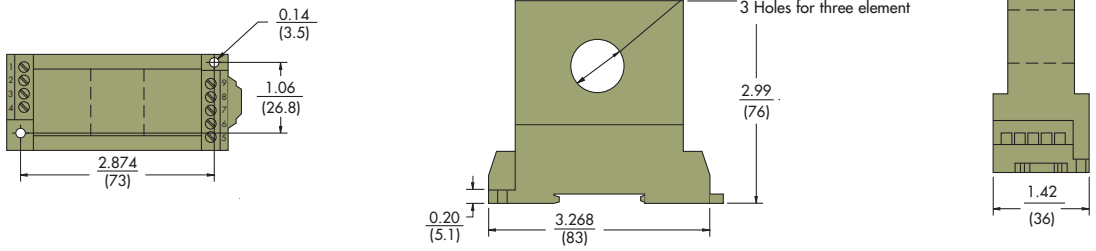
Basic Accuracy:..... 0.5%
Linearity:..... 10% to 100% FS
Thermal Drift:..... 500 PPM/°C
Operating Temperature:..... 0°C to +60°C
Installation Category:..... CAT II
Vibration Tested To:..... IEC 60068-2-6,1995
Pollution Degree:.....2
Response Time: ..... 250 ms max. 0-90% FS
Supply Voltage:..... 12 to 24 VDC
MTBF:.....Greater than 100 K hours
Frequency Range:.....50 Hz - 400 Hz, sine wave
Insulation Voltage:..... 2500 VDC
Altitude:..... 2000 meter max.Output
Load:..... 4-20 mADC -0 to 300 Ω
0-5 VDC - 2K Ω or Greater

Cleaning:..... Water-dampened cloth
Relative Humidity:... 80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C

Supply Current:

CR6210:.....	Typical 35mA	Max 45mA
CR6220:	Typical 75mA	Max 110mA
CR6230:.....	Typical 50mA	Max 70mA
CR6240:	Typical 75mA	Max 110mA
CR6250:.....	Typical 50mA	Max 70mA
CR6260:	Typical 75mA	Max 120mA

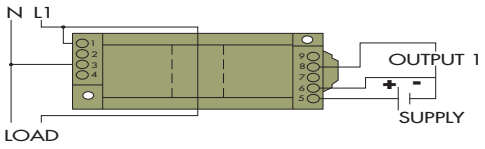
Torque Specs.:.....3.0 inch lbs. (0.4Nm)
Weight:.....0.5 lbs.



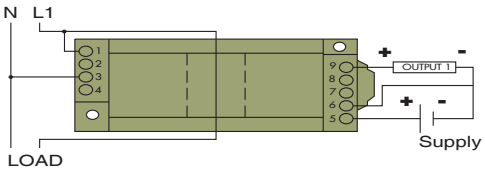
OUTLINE DRAWING

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

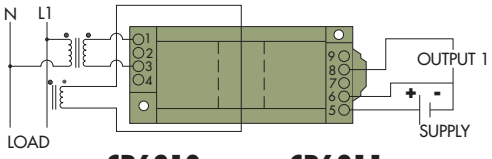
DIN RAIL / PANEL MOUNT, AVERAGE SENSING



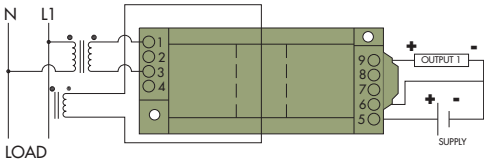
CR6210 CR6211
Single element, 0 - 5 VDC Output



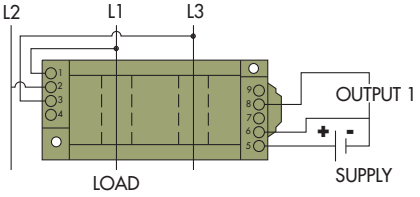
CR6220 CR6221
Single element, 4 - 20 mADC Output



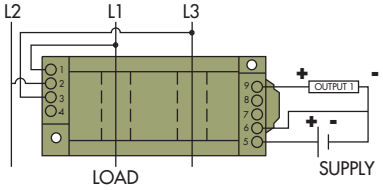
CR6210 CR6211
Single element, 0 - 5 VDC Output
with external voltage transformers



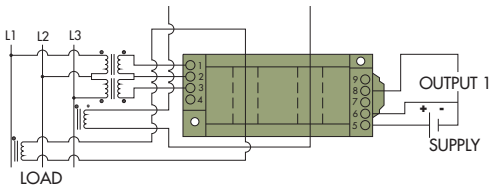
CR6220 CR6221
Single element, 4 - 20 mADC Output
with external voltage transformers



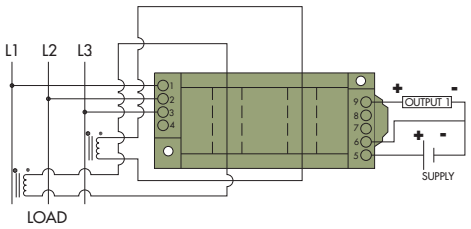
CR6230 CR6231
3 element - 3 Wire, 0 - 5 VDC Output



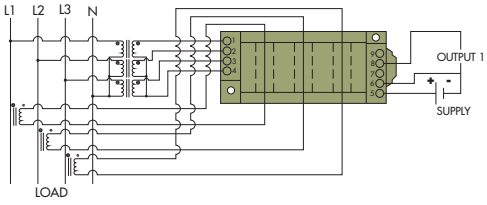
CR6240 CR6241
3 element - 3 Wire, 4 - 20 mADC output



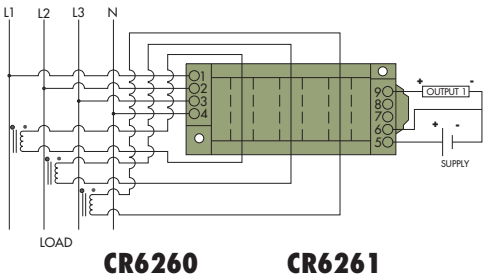
CR6230 CR6231
3 element - 3 Wire, 0 - 5 VDC Output
shown with external voltage and current transformers



CR6240 CR6241
3 element - 3 Wire, 4 - 20 mADC Output
shown with external current transformer



CR6250 CR6251
3 element - 4 Wire, 0 - 5 VDC Output
shown with external voltage and current transformers



CR6260 CR6261
3 element - 4 Wire, 4 - 20 mADC Output
shown with external current transformers

CONNECTION DIAGRAMS

The Professional Energy Monitoring Company
CR MAGNETICS
ISO 9001:2008 Quality Management System
3500 Scarlet Oak Blvd. St. Louis MO USA 63122 V: 636-343-8518 F: 636-343-5119
Web: http://www.crmagnetics.com

E-mail: sales@crmagnetics.com

DIN RAIL / PANEL MOUNT, AVERAGE SENSING

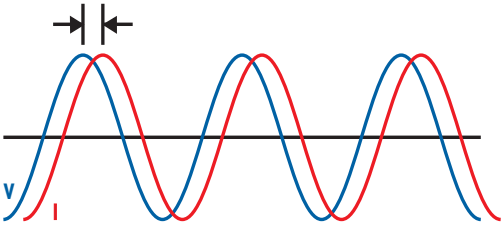
Single Element
0 - 5 VDC, 0 - 10 VDC,
4 - 20 mADC Outputs

The **CR6300** Series, Power Factor Transducers, are designed to sense the Phase Angle difference between AC Current and Voltage signals.

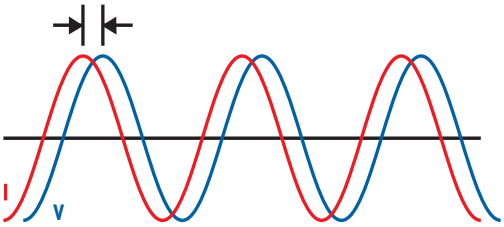
Applications
Motor Loading
Correct Power Factor
Measure Timing

Features
Bandwidth is 5 KHz
Up to 500V Input on Voltage
Up to 25A Input on Current
Extend Ranges with External CT's & PT's
Measure -90 to +90 Phase Difference
Available with 0-5 VDC, 0-10 VDC or 4-20 mADC Outputs
35mm DIN Rail or Panel Mount

Regulatory Agencies
Constructed to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1



INDUCTIVE - CURRENT LAGGING VOLTAGE



CAPACITIVE - CURRENT LEADING VOLTAGE

RoHS 2002/95/EC

Custom units can measure the phase angle difference between two AC Voltages or two AC currents are available. Contact factory for details.

PART NUMBERS					
CR6310	-		-		Single Element with 0 - 5 VDC Output
CR6311	-		-		Single Element with 0 - 10 VDC Output
CR6320	-		-		Single Element with 4 - 20 mADC Output

Add suffix for input range

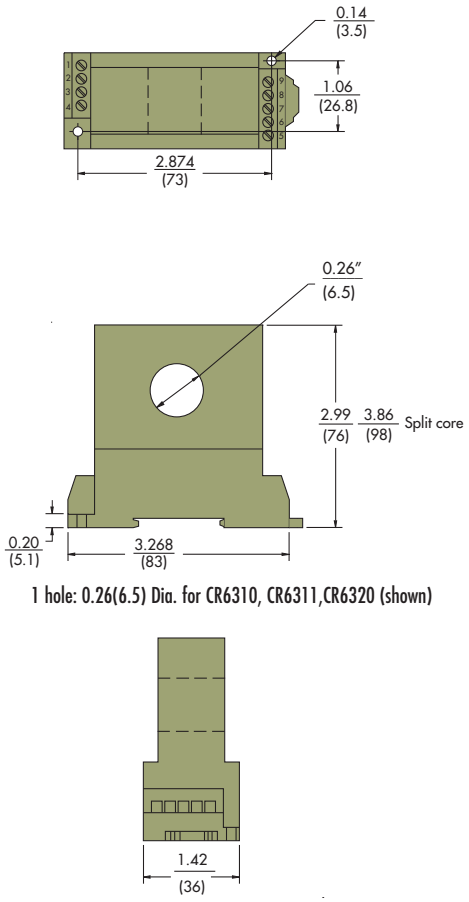
110 - 0-110 VAC
220 - 0-220 VAC
500 - 0-500 VAC *
Ranges available up to and including 600 VAC

25 - 0-25 AAC
Use a 5 amp CT to extend the range of this product line

DIN RAIL / PANEL MOUNT, AVERAGE SENSING

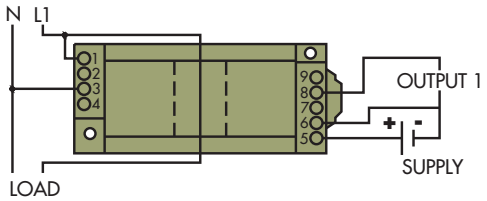
SPECIFICATIONS

Basic Accuracy:	0.5%
Linearity:	10% to 100% FS
Thermal Drift:	500 PPM/°C
Operating Temperature:	0°C to +60°C
Installation Category:	CAT II
Vibration Tested To:	IEC 60068-2-6,1995
Pollution Degree:	2
Response Time:	250 ms max. 0-90% FS
Supply Voltage:	12 to 24 VDC
MTBF:	Greater than 100 K hours
Frequency Range:	50 Hz - 400 Hz, sine wave
Insulation Voltage:	2500 VDC
Altitude:	2000 meter max.
Output Load:	4-20 mADC -0 to 300 Ω 0-5 VDC - 2K Ω or Greater
Cleaning:	Water-dampened cloth
Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Torque Specs.:	3.0 inch lbs. (0.4Nm)
Weight:	0.5 lbs.

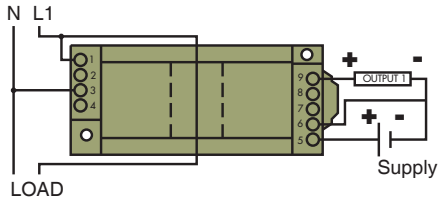


1 hole: 0.26(6.5) Dia. for CR6310, CR6311,CR6320 (shown)

OUTLINE DRAWING



CR6310 0 - 5 VDC Output
CR6311 0 - 10 VDC Output



CR6320 4 - 20 mADC Output

CONNECTION DIAGRAM

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

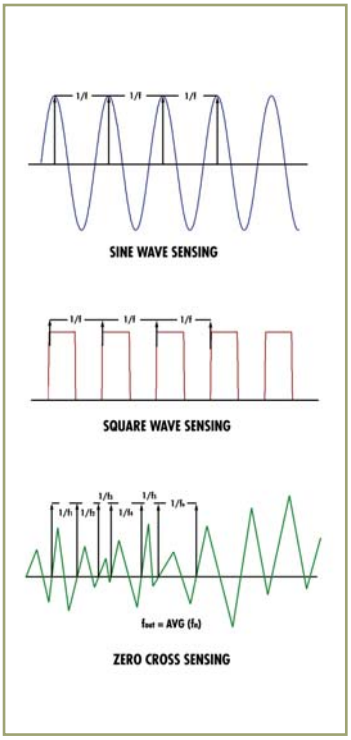
The Professional Energy Monitoring Company
CR MAGNETICS
ISO 9001:2008 Quality Management System
3500 Scarlet Oak Blvd. St. Louis MO USA 63122 V: 636-343-8518 F: 636-343-5119
Web: http://www.crmagnetics.com
E-mail: sales@crmagnetics.com

DIN RAIL / PANEL MOUNT

The **CR6600** Series, Frequency Transducers and Transmitters are designed to give a DC output that is proportional to an input frequency value. These devices are especially suited to variable frequency systems.

CR6610 **CR6620**
CR6611 **CR6621**
CR6612 **CR6622**

40 - 5000 Hz Input Range



Applications
Outputs isolated from inputs
Ranges available for any application
Sine, square and zero crossover waveforms
35 DIN rail or panel mount
Connection diagram printed on case

Features
35mm DIN Rail or Panel Mount
Available with 0 - 5 VDC, 0 - 10, or 4 - 20 mADC output
24 VDC powered
Use with external current transformers
Highest precision available
Connection diagram printed on case

Regulatory Agencies
Constructed to meet UL 61010B-1
Constructed to meet CAN/CSA-C22.2, No. 61010-1-2004
Meets requirement of IEC 61010-1 and BS EN 61010-1

RoHS 2002/95/EC

Custom calibrations of unique full scale and zero scale values including parametric measurements are available. Contact factory for details.

C Transducers

Add suffix for input range

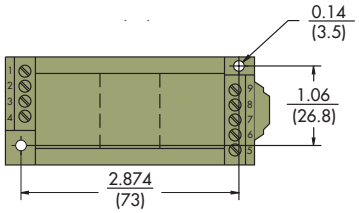
PART NUMBERS			
CR6610	-		Sine wave sensing with 0 - 5 VDC Output
CR6611	-		Square wave sensing with 0 - 5 VDC Output
CR6612	-		Zero crossover sensing with 0 - 5 VDC Output
CR6620	-		Sine wave sensing with 4 - 20 mADC Output
CR6621	-		Square wave sensing with 4 - 20 mADC Output
CR6622	-		Zero crossover sensing with 4 - 20 mADC Output

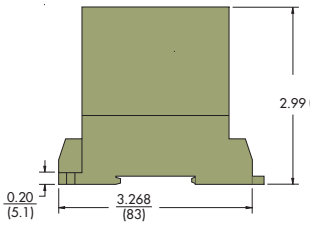
100 - 0-100 Hz
500 - 0-500 Hz
5000 - 0-5000 Hz
other ranges available

DIN RAIL / PANEL MOUNT

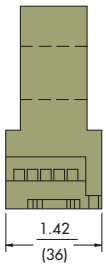
SPECIFICATIONS

Basic Accuracy:	0.5%
Linearity:	10% to 100% FS
Thermal Drift:	500 PPM/°C
Operating Temperature:	0°C to +60°C
Installation Category:	CAT II
Vibration Tested To:	IEC 60068-2-6,1995
Pollution Degree:	2
Response Time:	250 ms max. 0-90% FS
Supply Voltage:	12 to 24 VDC
MTBF:	Greater than 100 K hours
Frequency Range:	50 Hz - 400 Hz, sine wave
Insulation Voltage:	2500 VDC
Altitude:	2000 meter max.
Output Load:	4-20 mADC -0 to 300 Ω 0-5 VDC - 2K Ω or Greater
Cleaning:	Water-dampened cloth
Relative Humidity:	80% for temperatures up to 31°C and decreasing linearly to 50% at 40°C
Input Voltage:	20 to 250 V Peak, (other voltage ranges available)
Supply Current:	
CR6610:	Typical 30mA Max 40mA
CR6620:	Typical 50mA Max 95mA
Torque Specs.:	3.0 inch lbs. (0.4Nm)
Weight:	0.5 lbs.

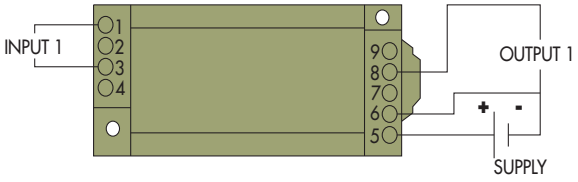




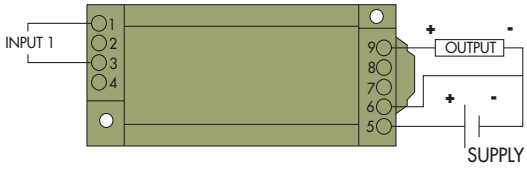
Dimensions for All CR6600 Series (shown)



OUTLINE DRAWING



CR6610 0 - 5 VDC Output
CR6611 0 - 5 VDC Output
CR6612 0 - 5 VDC Output



CR6620 4 - 20 mADC Output
CR6621 4 - 20 mADC Output
CR6622 4 - 20 mADC Output

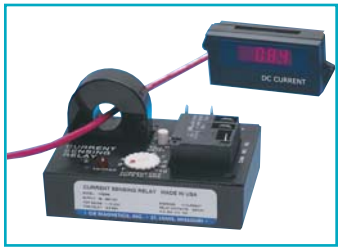
CONNECTION DIAGRAM

NOTE: The building installation must have a switch or circuit-breaker that is in close proximity and within easy reach of the operator. The switch or circuit breaker shall be marked as the disconnecting device for the equipment.

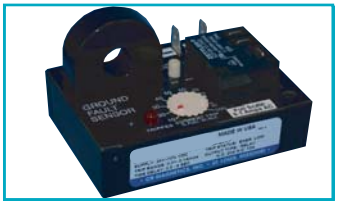
Sensing Relays and Switches

CR Magnetics Sensing Relays and Switches provide a simple method of monitoring electrical properties and alerting a system to a fault or event condition. These products are available with a wide variety of configurations, including time delays, various output styles and logic. From simple proving switches, to fully featured high performance ground fault sensing, our relays and switches will provide the designer with the tools needed to implement many different control and event sensing schemes.

The **CR4395** Series of **AC Current Sensing Relays** are designed to provide a contact output that becomes active when the setpoint AC Current is reached. Available in active high or active low, this relay is a fully featured product, with an adjustable activation delay, adjustable setpoint, dry contact relay or solid state outputs, and remote sensing capabilities.



The **CR5395** Series of **DC Current Sensing Relays** are designed to provide a contact output that becomes active when the setpoint DC Current is reached. Similar to the CR4395, this product includes adjustable activation delay, adjustable setpoint, and choice of output styles. An important feature of this design is the use of a magnetic modulator to detect the magnetic fields generated by current in the conductor. This enables the use of torroid current transformer technology that inherently rejects the effects of outside magnetic influences. Hall effects and other types of technologies must be on-site calibrated to adjust for stray magnetic fields present in most industrial applications.



The **CR7310 Ground Fault Sensor** provides an easy method in realizing equipment AC ground fault protection. Using the same footprint as our other fully featured products, the **CR7310** can sense currents down to 10 mAAC and up to 100 AAC. Various power supplies, current ranges, and sensor configurations are available.

The **CR3395** and **CR3495 Process Alarms** are products that can be added to standard analog process signals and create alarms and level indication. Adjustable time delays, various power supplies, current ranges, and sensor configurations are available.

The **CR9300**, **CR9400, CR9500** and **CR9600 Current Switches and Sensors** are go/no-go proving switches that are self powered with solid state dry contact modeled outputs. Output styles are designed to provide the highest current switching capability possible at the lowest possible switchpoint. Normally closed and normally open logic are available.

Selection Guide

	CR4395	CR5395	CR7310	CR3395	CR3495	CR9321	CR9350	CR9380	CR9421	CR9450	CR9480	CR9521	CR9550	CR9580	
AC Current Sensing	✔	✔	✔			✔	✔	✔	✔	✔	✔	✔	✔	✔	SENSE
DC Current Sensing		✔		✔											
DC Voltage Sensing					✔										
Ground Fault			✔												
Relay Output	✔	✔	✔	✔	✔										APPLICATIONS
Solid State Output	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
Time Delay	✔	✔	✔	✔	✔										
Adjustable Setpoint	✔	✔	✔	✔	✔										
Wire Mount						✔	✔	✔	✔	✔	✔	✔	✔	✔	
DIN Rail Mount				✔	✔										
Panel Mount	✔	✔	✔	✔	✔		✔	✔		✔	✔	✔	✔	✔	
Remote Sensing	✔	✔	✔												
Split Core								✔			✔	✔	✔	✔	
UL/CSA Approved	✔		✔												AGENCY
RoHS Compliant	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	

PART ORDERING FOR CR4395, CR5395 CR7310

CR ☐☐☐☐-☐☐-☐☐☐-☐☐☐-☐-☐☐☐-☐☐☐☐-☐

MODEL NUMBER
4395 - AC CURRENT
5395 - DC CURRENT
7310 - GROUND FAULT

LOGIC
EH - ENERGIZE HIGH
LH - LATCH HIGH
EL - ENERGIZE LOW
LL - LATCH LOW

POWER SUPPLY
120 - 120 VAC
240 - 240 VAC
24D - 24VDC
ACV - 80 TO 240 VAC

TRIP RANGE
.011 - 10 mA to 100 mA*
.11 - 100 mA to 1 A*
110 - 1 A to 10 A
330 - 3 A to 30 A
660 - 6 A to 60 A
101 - 10 A to 100 A
* - 7310 ONLY

TIME DELAY
A - .5 TO 6 SEC
B - 2 TO 25 SEC
C - .1 TO 1 SEC
X - NO DELAY

CALIBRATION
CD - CALIBRATED DIAL
FP - FIXED SETPOINT

OUTPUT STYLE
ELR - FORM C RELAY
NPN - ISOLATED TRANSISTOR
TRC - ISOLATED TRIAC

SENSOR STYLE
I - INTERNAL
R - REMOTE

PART ORDERING FOR CR3395, CR3495, CR9321 AND CR9600

CR ☐☐☐☐

MODEL NUMBER
3395 - 4-20 mA LOOP ALARM
3495 - 0-5 VDC PROCESS ALARM

CR ☐☐☐☐-☐☐☐-☐

MODEL NUMBER
9321 - WIRE MOUNTED
9350 - WIRE MOUNTED
9380 - SPLIT CORE
9421 - WIRE MOUNTED
9450 - PANEL MOUNTED
9480 - SPLIT CORE
9521 - WIRE MOUNTED
9550 - WIRE MOUNTED
9580 - SPLIT CORE

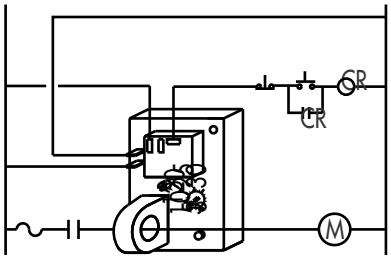
OUTPUT STYLE
NPN - PULL LOW NPN
PNP - PUSH HIGH PNP
ACA - AC VOLTAGE SWITCH

M MountingCase (Optional)

D

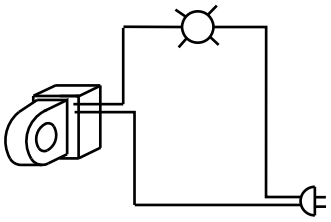
Relays, Switches, & Sensors

TYPICAL RELAY APPLICATIONS



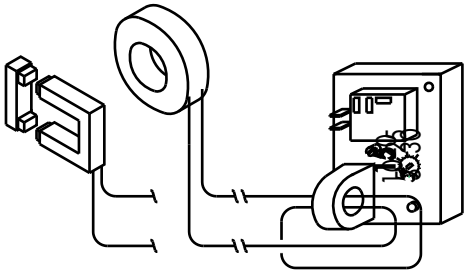
MOTOR OVER / UNDER MOTOR

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) trip status, when the motor current draw exceeds the trip point, the relay will energize and open the starter motor. 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 be required for complete motor protection.



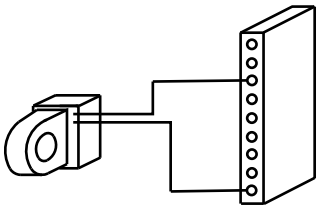
CONNECTION TO INDICATOR LAMP

The current switch may be used to 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 a indictive device such as a eletromechanical relay.



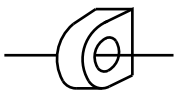
EXTERNAL CURRENT TRANSFORMERS

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 (Section F, Pages 94-107) 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.

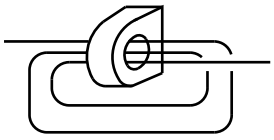


CONNECTION TO PLC

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.

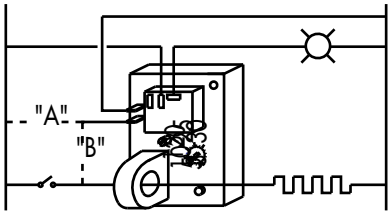


ONE WIRE PASS



THREE WIRE PASS

The trip ranges shown on Page 63 represent on 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. I.E. a name plate range of -660 (6.0 to 60 ACA) with three wire passes would provide an actual range of 2.0 to 20 ACA (6/3=2.0 & 60/3=20).



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 status 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.

CR4395 Series

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 electromechanical relay is energized. A precision voltage reference circuit ensures a highly repeatable trip point.

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 (-ELR)

Arrangement: 1 Form C (SPDT)
Contact Material: Silver-cadmium oxide
Terminals: 3 1/4" Male QC
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

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 (-TRC)

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.
Terminals: 2 @ 1/4" Male QC

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 1 AC 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:
Typical 80mA Max 100mA
Sensed Current:
Max. Continuous: 200% Full Scale
Frequency: 60-400 Hz *
*All specifications for operation at 60 Hz only
Altitude: 2000 meters max.
(Contact factory for High Altitude applications)
Weight 0.5 LBS.

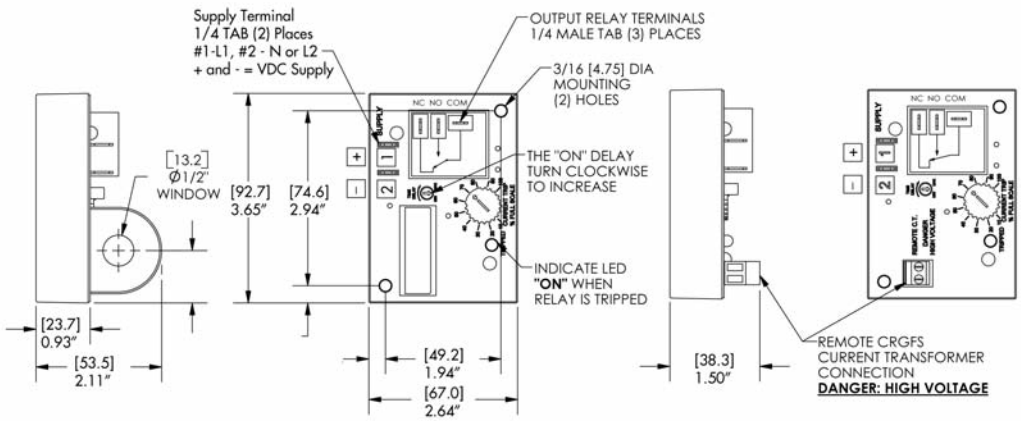
Regulatory Agencies

c UL us E234389

RoHS

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

OUTLINE DRAWING

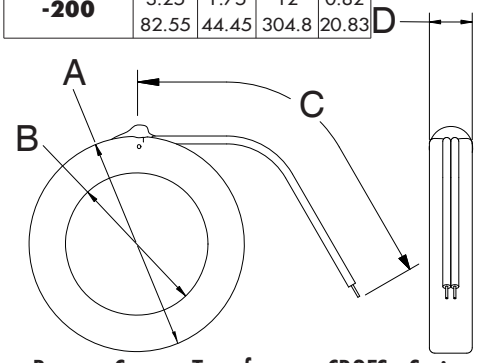


Top view of Current Sensing Relay

Shown with Remote Current Transformer Option (-R)

CR4395 Series

CRGFS	A	B	C	D
-100	2.88 73.16	1.60 40.58	12 304.8	0.79 20.07
-200	3.25 82.55	1.75 44.45	12 304.8	0.82 20.83



Remote Current Transformers CRGFS - Series

PART NUMBER

CR4395	-			-				-				-				-				-		

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 the 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.

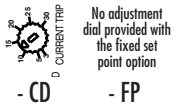
SUPPLY VOLTAGE
AC
120 - 120 VAC
240 - 240 VAC
DC
24D - 24 VDC

All supply voltage tolerances are ± 10 %

TRIP RANGE
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 ON DELAY
A - .5 to 6 Sec.
B - 2 to 25 Sec.
C - .1 to 1 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.

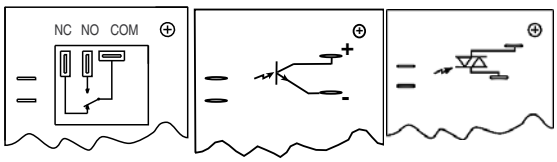
TRIP POINT DIAL
CD - Calibrated Dial
FP - Fixed Trip Point
(Specify value of fixed trip point with order)



- CD - FP
-3.30 trip range shown

I - INTERNAL TRANSFORMER
R1 - REMOTE TRANSFORMER w/ CRGFS-100 (1.60" window diameter)
R2 - REMOTE TRANSFORMER w/ CRGFS-200 (1.75" window diameter)

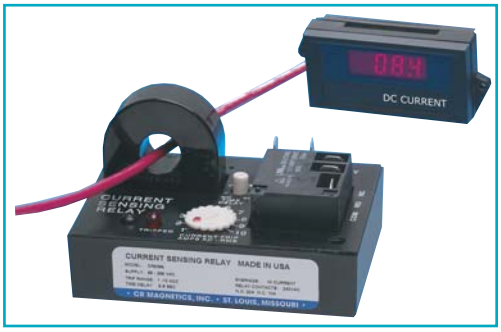
OUTPUT OPTIONS



ELR Electromechanical Relay
NPN Optoisolated NPN Transistor
TRC Optoisolated Triac, Zero Crossing

Example Part Numbers:
CR4395-EH-120-110-CD-ELR-I (Relay with CT on board)
CR4395-EL-240-330-CD-NPN-R1 (Relay with external CRGFS-100)

CR5395 Series



The **CR5395** Series, Direct Current Sensing Relay provides a precision and cost effective method for monitoring Direct Current. Magnetic Modulator Technology is utilized for the current sensing to provide a stable and highly repeatable current trip. The current-carrying wire is routed through the opening extending through 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 electromechanical relay energizes.

OUTPUT OPTIONS

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

RELAY (-ELR)

Arrangement: 1 Form C (SPDT)
Contact Material: Silver-cadmium oxide
Terminals: 3 1/4" Male QC
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

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)
Terminals: 2 1/4" Male QC

AC SWITCHING (-TRC)

Off state voltage: 240 VAC RMS max.
Minimum switch voltage: 24 VAC RMS
On state current: 500 mA RMS max. continuous
Switching mode: Zero Crossing
Off state leakage: 60 ua @ 240 VAC max.
Terminals: 2 @ 1/4" Male QC

Applications

DC motor drives
Battery Chargers
Power Supply Management
Uninterruptible Power Systems
Motor Application

Features

Variable Trip Point and Time Delay
Bi-polar
Monitors Currents from 1.0 ADC to 100 ADC
Electrical Isolation Between Circuits
Output Relay Rated up to 20 Amps
LED Trip Status Indicator
Dead Band Prevents Relay Chatter
Calibrated Dial
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 +70° C
Storage Temperature: -55° C to +85°
0-95% RH, Non-condensing
Input Supply Power:
Typical 80mA Max 100mA
Sensed Current: Max. Continuous: 200% Full Scale
Altitude: 2000 meters max.
(Contact factory for High Altitude applications)
Weight 0.5 LBS.

Regulatory Agencies

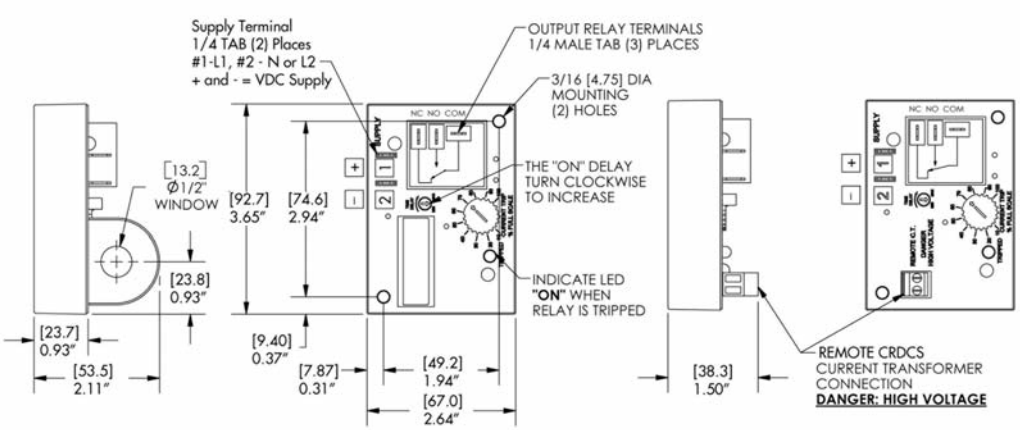
c UL us E234389

RoHS

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

OUTLINE DRAWING

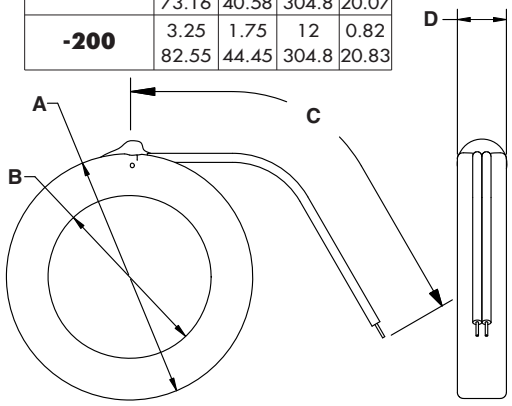
CR5395 Series



Top view of Current Sensing Relay

Shown with Remote Current Transformer Option (-R)

CRDCS	A	B	C	D
-100	2.88 73.16	1.60 40.58	12 304.8	0.79 20.07
-200	3.25 82.55	1.75 44.45	12 304.8	0.82 20.83



Remote Current Transformers CRDCS - Series

PART NUMBER

CR5395	-			-				-				-				-				-		

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 the 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.

SUPPLY VOLTAGE

ACV - 85 to 265 VAC/VDC

24D - 24 VDC

All supply voltage tolerances are ± 10 %

TRIP RANGE

110 - 1.0 to 10 ADC

330 - 3.0 to 30 ADC

660 - 6.0 to 60 ADC

101 - 10 to 100 ADC

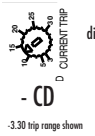
The trip ranges shown are for one wire pass through the window opening. The trip range may be proportionally lowered with additional wire passes through the window.

TRIP POINT DIAL

CD - Calibrated Dial

FP - Fixed Trip Point

(Specify value of fixed trippoint with order)



No adjustment dial provided with the fixed set point option

- CD - FP

-3.30 trip range shown

I - INTERNAL TRANSFORMER

R1 - REMOTE TRANSFORMER w/ CRDCS-100 (1.60" window diameter)

R2 - REMOTE TRANSFORMER w/ CRDCS-200 (1.75" window diameter)

TRIP ON DELAY

A - .5 to 6 Sec.

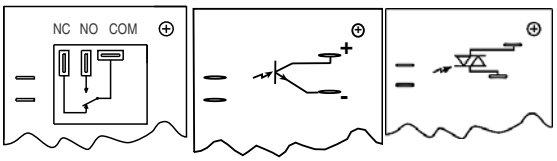
B - 2 to 25 Sec.

C - .1 to 1 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

Example Part Numbers:

CR5395-EH-ACV-110-CD-ELR-I (Relay with CT on board)

CR5395-EL-24D-330-CD-NPN-R1 (Relay with external CRDCS-100)

CR7310 Series

The **CR7310** Series, Ground Fault Sensor provides a reliable and cost effective method for sensing ground faults. The current-carrying wires are routed through the opening extending from the top of the case. When ground current reaches the level set by the trip point adjustment, the relay trips, illuminates the tripped LED and provides an output signal. A precision voltage reference circuit ensures a highly repeatable trip point. The Sensor is rated as a Class 1 device.

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 10mAAC to 100 AAC 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:
Typical 80mA Max 100mA
Sensed Current:
Max. Continuous: 200% Full Scale
Frequency: 60-400 Hz *
*All specifications for operation at 60 Hz only
Altitude: 2000 meters max.
(Contact factory for High Altitude applications)
Weight 0.5 LBS.

Regulatory Agencies

c UL us E211244

RoHS

OUTPUT OPTIONS

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

RELAY (-ELR)

Arrangement: 1 Form C (SPDT)
Contact Material: Silver-cadmium oxide
Terminals: $3^{1/4}$" Male QC
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

DC SWITCHING (-NPN)

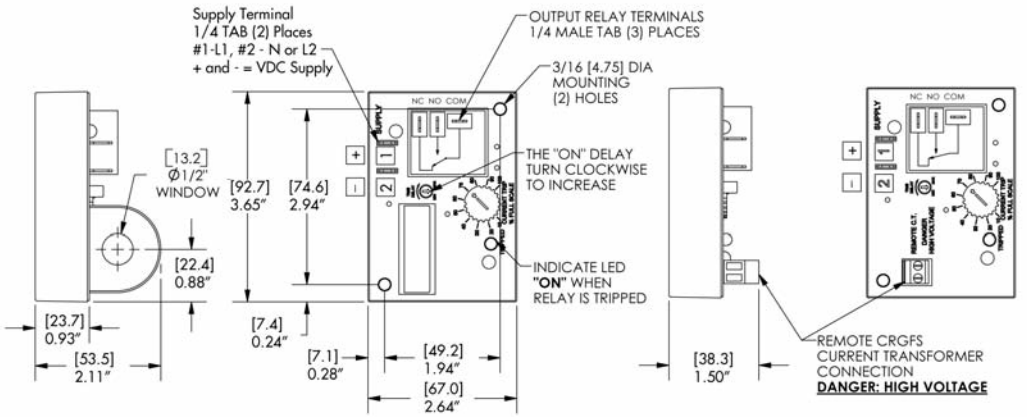
Vce (full off): 30 VDC max.
Isink (full on): 120 mADC max.@ rated full-on
Vce (full on): 1.5 VDC @ 120 mADC Isink
Off state leakage current: 5ua @ 30 VDC (typical)
Terminals: $2^{1/4}$" Male Q C

AC SWITCHING (-TRC)

Off state voltage: 240 VAC RMS max.
Minimum switch voltage: 24 VAC RMS
On state current: 500 mA RMS max. continuous
Switching mode: Zero crossing
Off state leakage: 60 ua @ 240 VAC max.
Terminals: 2 @ 1/4" Male QC

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

OUTLINE DRAWING

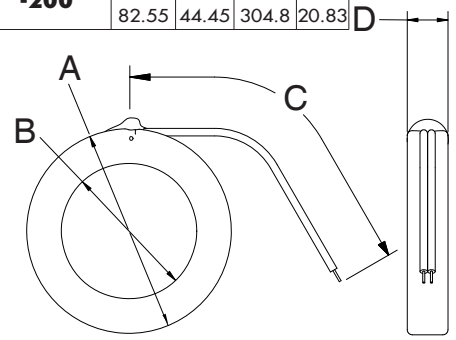


Top view of Current Sensing Relay

Shown with Remote Current Transformer Option (-R)

CR7310 Series

CRGFS	A	B	C	D
-100	2.88 73.16	1.60 40.58	12 304.8	0.79 20.07
-200	3.25 82.55	1.75 44.45	12 304.8	0.82 20.83



Remote Current Transformers CRGFS - Series

PART NUMBER

CR7310	-			-				-				-		-			-			-		

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 the 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.

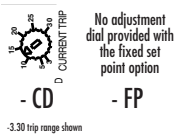
SUPPLY VOLTAGE
AC
120 - 120 VAC
240 - 240 VAC
DC
24D - 24 VDC

All supply voltage tolerances are ± 10 %

TRIP RANGE
.011 - .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 ON DELAY
A - .5 to 6 Sec.
B - 2 to 25 Sec.
C - .1 to 1 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.

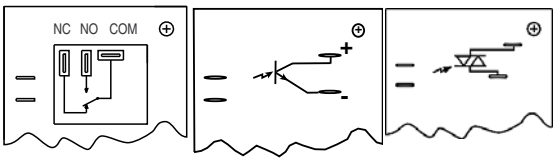
TRIP POINT DIAL
CD - Calibrated Dial
FP - Fixed Trip Point
(Specify value of fixed trippoint with order)



- CD - FP
-3.30 trip range shown

I - INTERNAL TRANSFORMER
R1 - REMOTE TRANSFORMER w/ CRGFS-100 (1.60" window diameter)
R2 - REMOTE TRANSFORMER w/ CRGFS-200 (1.75" window diameter)

OUTPUT OPTIONS



ELR Electromechanical Relay
NPN Optoisolated NPN Transistor
TRC Optoisolated Triac, Zero Crossing

Example Part Numbers:
CR7310-EH-120-.011-CD-ELR-I (Relay with CT on board)
CR7310-EL-240-.11-CD-NPN-R1 (Relay with external CRGFS-100)

CR3395/3495 Series

The **CR3395** and **CR3495** Series, Process Alarm Switch provides an effective method for signaling alarm status. The Process Alarm Switch can be fed by any 0-5V or 4-20mA process control loop. When the control loop signal exceeds the set point the board LED illuminates and the relay becomes energized.

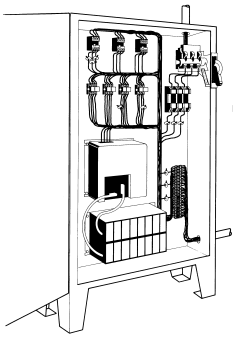
Process Alarm Switch

Applications
Process Control Systems
Reporting of Alarm Conditions
Monitor Heater Status
Monitor Motor Operation

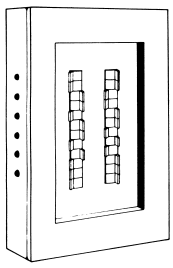
Features
35mm DIN Rail or Panel Mountable
Adjustable Dial for Setting Trip Point
Super Bright Red LED Indicator for Alarm Status
Fully Isolated Input from Power Supply and Output
Connection Drawing Printed on Case

Specifications
+24 VDC +/-10% Power Supply
Form C Relay, 7A @ 250 VAC,
12A @ 125 VAC,
10A @ 28 VDC
Input: 4-20 mADC (CR3395) and 0-5VDC (CR3495)
Operating Temperature: 0 to 50°C
Weight 0.25 LBS

Regulatory Agencies

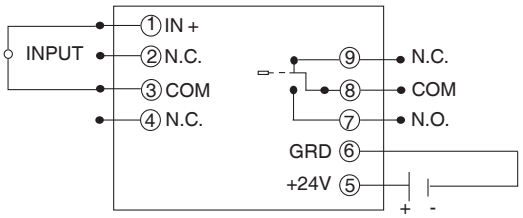


Load Center

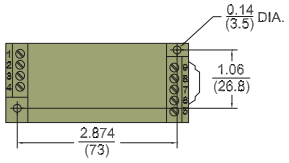


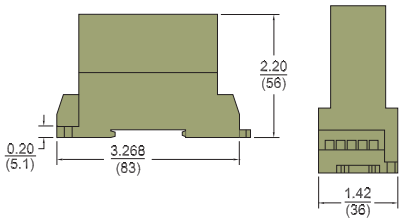
Control Panel

CONNECTION DRAWING



MECHANICAL

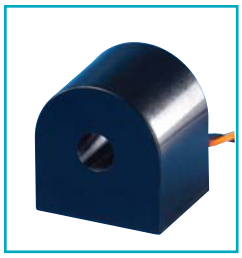




ORDER INFORMATION

Part Number	Input Range
CR3395	4 to 20 mADC
CR3495	0 to 5 VDC

CR9300 Series



CR9321 Non-Mounting Base

CR9350 Non-Mounting Base

CR9380 Non-Mounting Base

CR9380 with Mounting Base

The **CR9300** 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.

Applications

Continuity
Proving Switch

Features

Low Cost
Low Fixed Trip Point
Fully Isolated
Reverse Output Polarity Protected
Self-Powered

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
Weight 0.08 LBS.
*All specifications for operation at 60 Hz only

Regulatory Agencies

c UL us E234389

RoHS

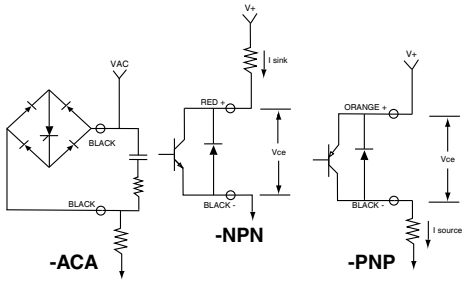
DC SWITCHING (-NPN or -PNP)

Vce (full off): 30 VDC max.
Isink (full on): 120 mADC max.@ rated full-on
Vce (reverse polarity voltage): 1.2 VDC @ 100 mADC
Vce (full on): 1.5 VDC @ 120 mADC Isink
Off state leakage current: 5ua @ 30 VDC (typical)

AC SWITCHING (-ACA)

Off state voltage: 240 VAC RMS max.
Minimum holding current: 10 mA
On state current: 0.8 AAC RMS max. continuous
Off state leakage: 50 ua @ 240 VAC max.
Peak Non-Repetitive Surge Current: 8 AAC RMS (1 cycle, 60 Hz.)

ELECTRICAL CONNECTIONS



PART NUMBER

CR					-				-		CURRENT SWITCH

9321	0.27 dia. Window
9350	0.61 dia. Window
9380	0.40 dia. Window

NPN	Transistor Output
PNP	Transistor Output
ACA	AC Output

M	MountingCase (Optional)

The Professional Energy Monitoring Company
CR MAGNETICS
ISO 9001:2008 Quality Management System

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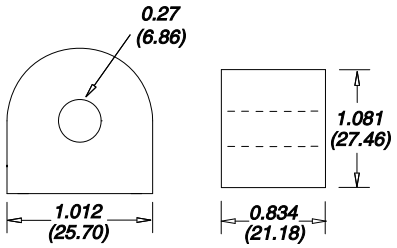
Web: http://www.crmagnetics.com

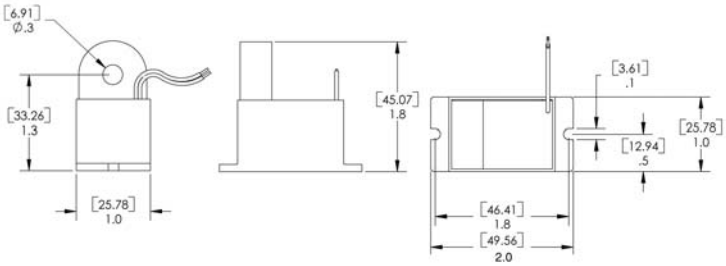
E-mail: sales@crmagnetics.com

CR9300 Series

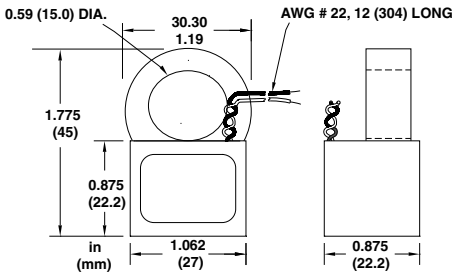
OUTLINE DRAWING



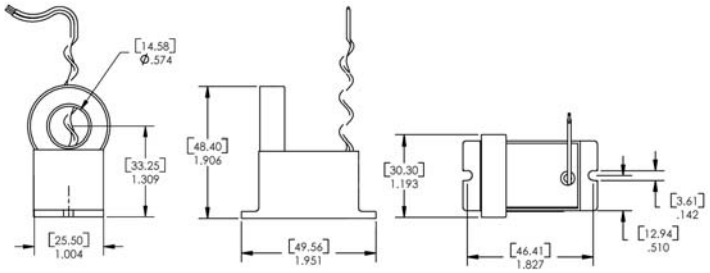
CR9321 with Non-Mounting Base



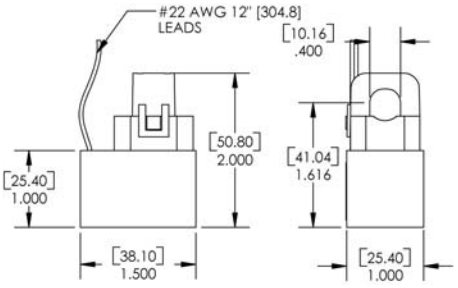
CR9321 with Mounting Base



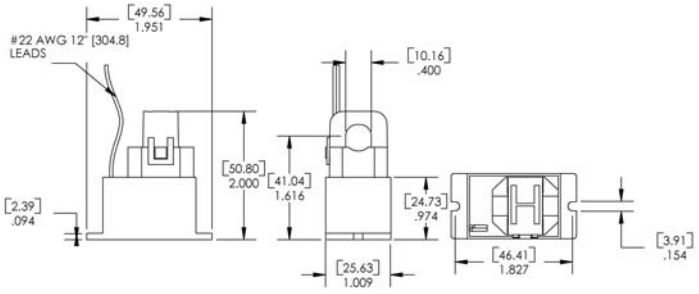
CR9350 with Non-Mounting Base



CR9350 with Mounting Base

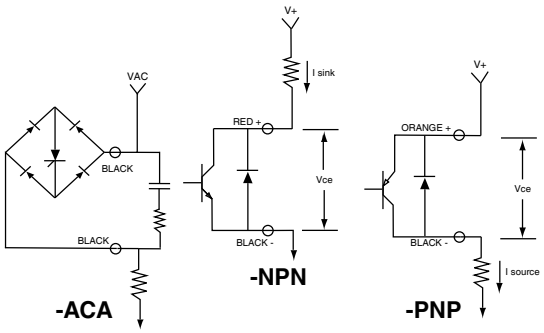


CR9380 with Non-Mounting Base



CR9380 with Mounting Base

ELECTRICAL CONNECTIONS



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CR9400 Series


CR9421 Non-Mounting Base


CR9450 Non-Mounting Base


CR9480 Non-Mounting Base


CR9480 with Mounting Base

The **CR9400** Series is a low cost, self powered, fixed set-point Current Switch designed for applications that require an on-off indication of current flow.

The normal state of the switch is On when the current level is zero. Current levels above the guaranteed full-off level will turn the output to Off. The Current Switch is recommended only for applications where the continuous operating level 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 available with a SCR output for switching AC. Connections can be made directly to items such as a PLC or electro-mechanical relay. Note that connections made directly to an inductive device such as an electro-mechanical relay will require a customer supplied clamping diode for DC operation or a snubber network for AC operation.

DC SWITCHING (-NPN or -PNP)

Vce (full off): 30 VDC max.
Isink (full on): 120 mADC max.@ rated full-on
Vce (reverse polarity voltage): 1.2 VDC @ 100 mADC
Vce (full on): 1.5 VDC @ 120 mADC Isink
Off state leakage current: 5ua @ 30 VDC (typical)

AC SWITCHING (-ACA)

Off state voltage: 240 VAC RMS max.
Minimum holding current: 10 mA
On state current: 0.8 AAC RMS max. continuous
Off state leakage: 50 ua @ 240 VAC max.
Peak Non-Repetitive Surge Current: 8 AAC RMS (1 cycle, 60 Hz.)

Applications

Continuity
Proving Switch

Features

Low Cost
Low Fixed Trip Point
Fully Isolated
Self-Powered

Specifications

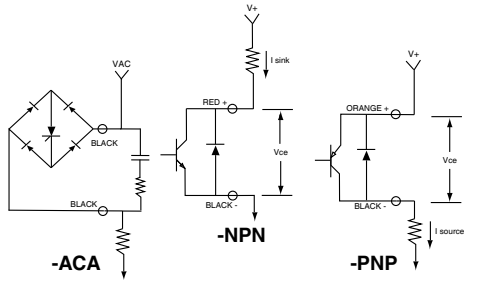
Rated Full-off: 0.400 AAC RMS
Turn-on Time: 100 ms. max. @ rated full-on
Turn-off Time: 250 ms. max. to 80% of Vce
Maximum sense current: Continuous: 100 AAC
1 Second: 500 AAC
Frequency*: 50 to 400 Hz
Operating Temperature: -30° C to +60° C
Storage Temperature: -55° C to +85° C
Weight 0.08 LBS.
*All specifications for operation at 60 Hz only

Regulatory Agencies

c UL us E234389

RoHS

ELECTRICAL CONNECTIONS



PART NUMBER

CR					-				-		CURRENT SWITCH

9421	.27 dia. Window
9450	61dia.Window
9480	0.40 dia. Window

NPN	Transistor Output
PNP	Transistor Output
ACA	AC Output

M	Mounting Case (Optional)

D

Relays, Switches, & Sensors

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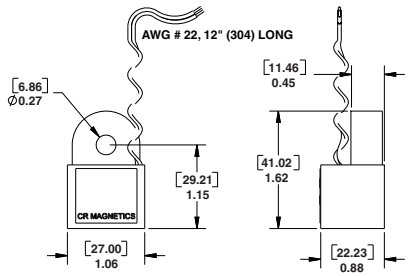
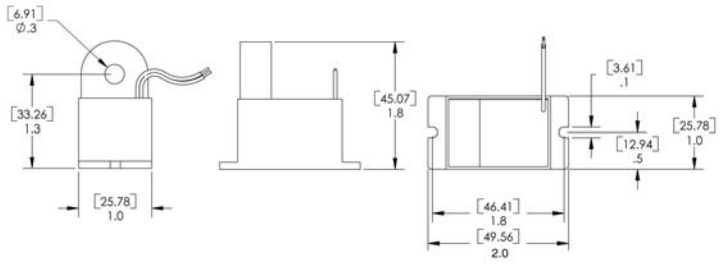
Split Core Current Switch - Normally Closed

CR9400 Series

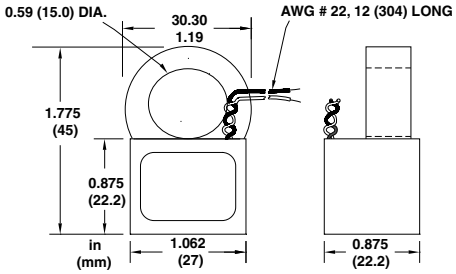
OUTLINE DRAWING



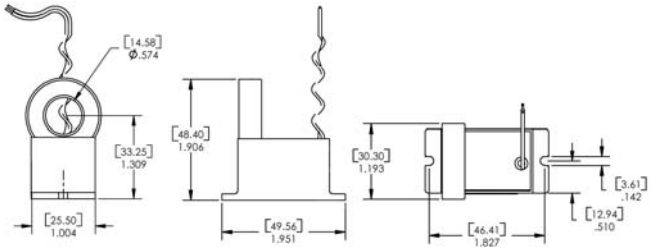
CR9421 with Non-Mounting Base



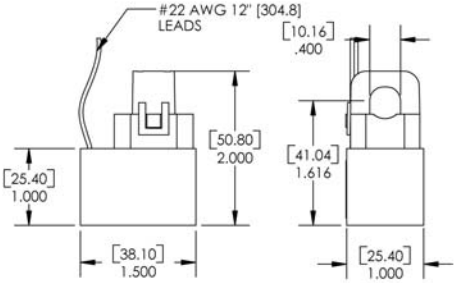
CR9421 with Mounting Base



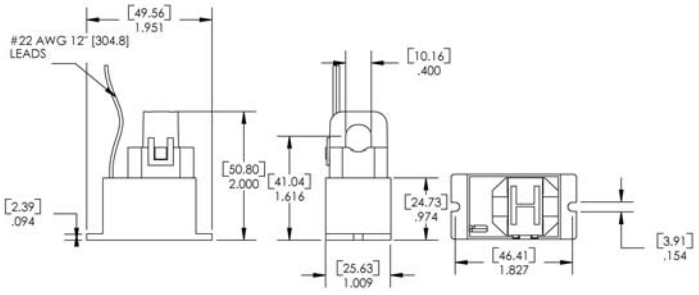
CR9450 with Non-Mounting Base



CR9450 with Mounting Base

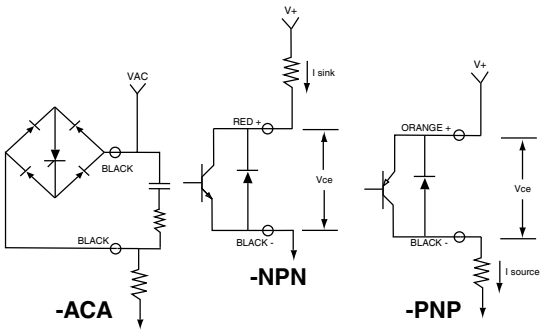


CR9480 with Non-Mounting Base



CR9480 with Mounting Base

ELECTRICAL CONNECTIONS



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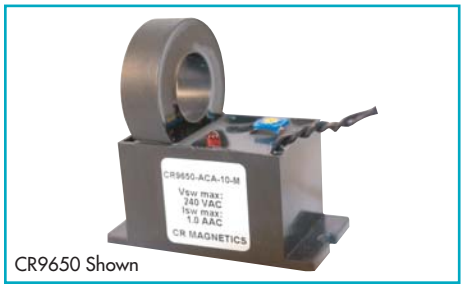
CR9600 Series



CR9650 Shown

The **CR9600** Series is a low cost, self powered, adjustable set-point Current Switch designed for applications that require an on-off indication of current flow. Current levels above the setpoint 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 1.0 Amps. 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.

DC SWITCHING (-NPN or -PNP)

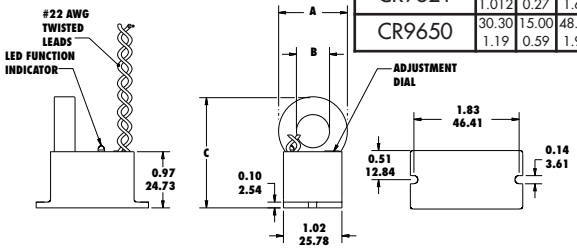
Vce (full off): 30 VDC max.
Isink (full on): 120 mADC max.@ rated full-on
Vce (reverse polarity voltage): 1.2 VDC @ 100 mADC
Vce (full on): 1.5 VDC @ 120 mADC Isink
Off state leakage current: 5ua @ 30 VDC (typical)

AC SWITCHING (-ACA)

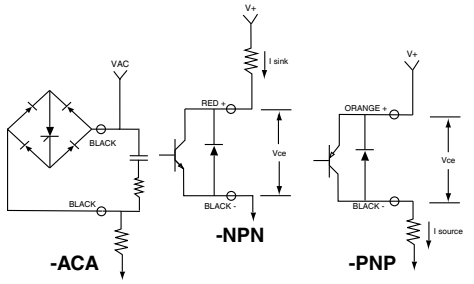
Off state voltage: 240 VAC RMS max.
Minimum holding current: 10 mA
On state current: 1.0 AAC RMS max. continuous
Off state leakage: 50 ua @ 240 VAC max.
Peak Non-Repetitive Surge Current: 8 AAC RMS (1 cycle, 60 Hz.)

OUTLINE DRAWING

Part Number	A	B	C
CR9621	25.70 1.012	6.86 0.27	40.64 1.60
CR9650	30.30 1.19	15.00 0.59	48.26 1.90



ELECTRICAL CONNECTIONS



Applications

Continuity
Proving Switch

Features

Low Cost
Adjustable Trip Point
#22 AWG 12" Lead Length
Reverse Output Polarity Protected
Self-Powered

Specifications

Rated Full-on: 1.0 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
Weight 0.08 LBS
*All specifications for operation at 60 Hz only

Regulatory Agencies

c UL us E234389

RoHS

PART NUMBER

CR					-			-				-		CURRENT SWITCH

9621	0.27 dia. Window
9650	0.59 dia. Window

INPUT RANGE
10
25
50

NPN	Transistor Output
PNP	Transistor Output
ACA	AC Output

M	Mounting Case

D

Relays, Switches, & Sensors

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Current Sensor


CR9521 Non-Mounting Base


CR9550 Non-Mounting Base


CR9580 Non-Mounting Base


CR9580 with Mounting Base

The **CR9500** Series Current Sensors provides a cost effective method for monitoring electrical current. The sensor generates a 0-5 VDC signal proportional to the input AC current. The output signal is average sensing, calibrated to RMS.
The sensor is used with process control and industrial instrumentation equipment. Especially suited for OEM applications that require a low cost solution for numerous monitoring locations. The DC output can be connected directly to an analog input connection without additional signal conditioning. Care must be taken to ensure the burden impedance of the instrumentation is greater than 1.0 megohm. The unit will operate with lower burden impedance but at reduced accuracy.

Applications
OEM Current Sensing
Home Automation
Monitor Motor Operation

Features
Low Cost
Low Fixed Trip Point
Fully Isolated, Reverse Polarity Protected
Self-Powered
Available in Mountable Package
Output Overload Protected

Specifications
Accuracy: ±0.5% Full Scale (FS)
Ripple: 1% Max
Signal Out: 0-5 VDC
Max. Signal Out: 12 VDC
Frequency * : 50 to 400 Hz
Insulation Class: 600 V
Operating Temperature: -30 C to + 60 C
Storage Temperature: -55 C to + 85 C
Shipping Weight: 2 oz. (.06 Kg.)
Dielectric Withstand: 2,500 Vrms
Response Time: 250 ms. max. 10-90% FS
Calibration: Avg. Sensing, RMS Calibrated
Output Load: 1.0 Megohm or greater for rated accuracy
Weight 0.11 LBS.
* All specifications for operation at 60 Hz

Regulatory Agencies

c UL us E234389

RoHS

PART NUMBER

CR					-			-	

9521	.27″ dia. Window
9550	.61″ dia. Window
9580	.40″ Splitcore

INPUT RANGE
10
20
50

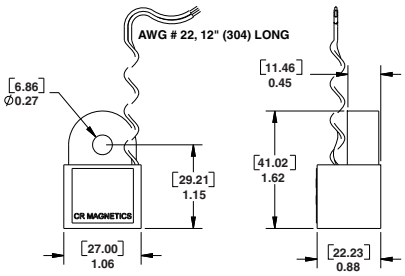
M	Mounting Case (optional)

D

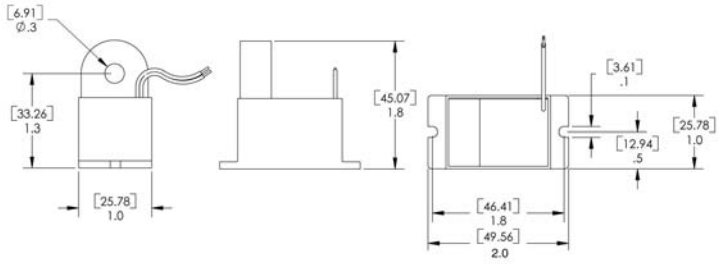
Relays, Switches, & Sensors

CR9500 Series

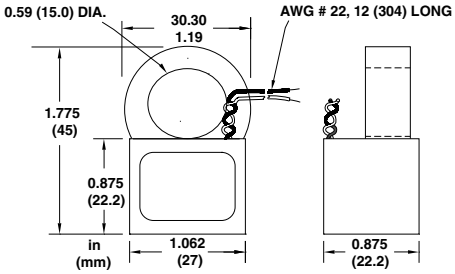
OUTLINE DRAWING



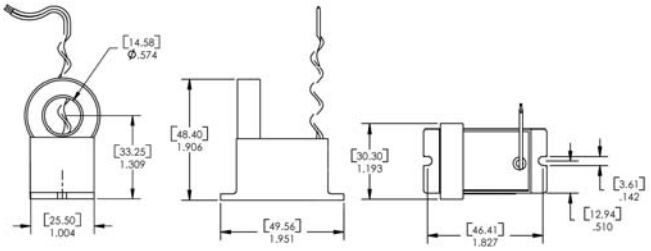
CR9521 with Non-Mounting Base



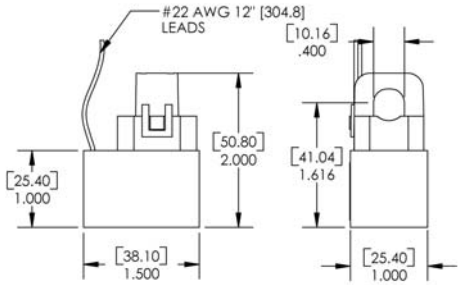
CR9521 with Mounting Base



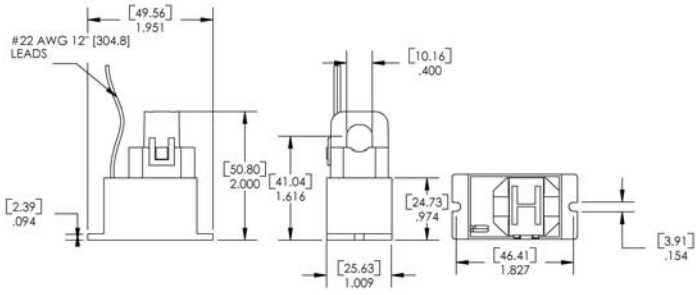
CR9550 with Non-Mounting Base



CR9550 with Mounting Base



CR9580 with Non-Mounting Base



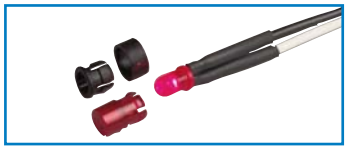
CR9580 with Mounting Base

Indicators & Displays

CR Magnetics Indicators are designed to give the designer an easy and low cost method of sensing electrical properties. The simple indicating LED represents the presence of AC current in a conductor placed through the sensing ring. Useful for quick and easy analysis of heater elements, lighting filaments, and motor operation, these products save money by increasing efficiency, decreasing down time, and improving maintenance operations.

The **CR45 Current Indicator** is our most popular indicator product. Self powered and in a complete self contained package, the CR45 is a wire mountable unit shipped complete with a wire mounting anchor. Use the MB45 bracket for panel mounting. The CR45 is available in red, green, blue, white, yellow and amber LEDs.

The **PH31 Series** are remote panel mounted indicators designed to provide remote AC current indication and status. The bezel mounting design allows for use in NEMA and fluid spray cabinets. Use with the Model 18 or Model 19 remote current sensors.

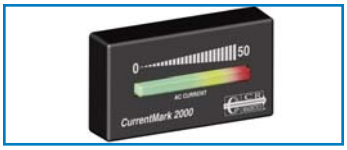


The **PH25 Series** remote panel mounted indicators are for use in less stringent environment panels. Identical electrically to the PH31, the snap-in panel mount action makes assembly quick and easy. Available in all colors.

The **CR2530 Series Remote Electrical Current Indicators** are an economical method for providing a visual indication of current flow. The value of the turn-on point is determined by the customer and specified in the part number.

The **CR2550 Low Cost Current Indicator** is designed for use in high volume applications. Entirely self contained construction provides a complete low cost solution that is easily mounted and provides snap in panel construction.

The **Current Mark Displays** are designed as a low cost method for providing a visual indication and measurement of electrical current flow. The current-carrying wire is routed through the window opening in the current sensing transformer, providing sensing and power for the instrument.



CRM1000 Series high efficiency, 7 LED indicator that illuminates as the current approachs the full scale range.

CRM2000 Series is a modern looking light bar with nice visual appeal.

CRM3000 Series is an auto-ranging display with an input range up to 50 AAC.

	CR45	PH31	PH25	CR2550	MODEL 18	MODEL 19
AC Current Sensing	✔	✔	✔	✔	✔	✔
Self Contained	✔			✔		
Panel Mount	✔	✔	✔	✔	✔	
Wire Mount	✔			✔		✔
NEMA Rated		✔				
Low Cost			✔	✔		✔
Remote Sensing		✔	✔	✔	✔	✔
MB-18 Bracket					✔	
MB45 Bracket	✔					

INDICATOR PART ORDERING

CR45 - ❑

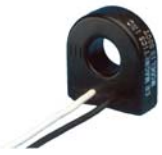
PH31 - ❑

PH25 - ❑

CR2550 - ❑

R - Red	W - White
G - Green	Y - Yellow
B - Blue	A - Amber

MODEL 18-600 Sensor



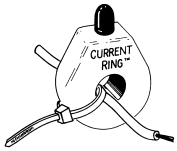
MODEL 19 Sensor

MB-18 Mounting Bracket

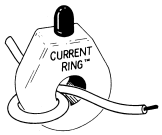
MB45 Mounting Bracket

CR45 Series

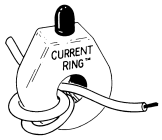
MB45 Bracket



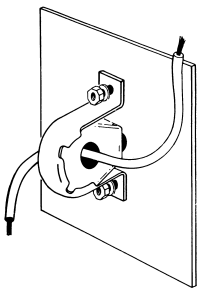
One-Wire Pass



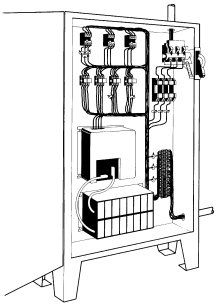
Two-Wire Passes



Three-Wire Passes

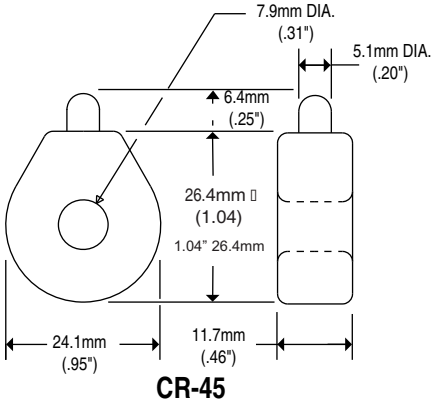


Panel Mount



Load Center

PART NUMBERS		
Part Number	LED Color	Turn On Point (1 pass)
CR45-R	Red	2.0 AAC
CR45-G	Green	2.5 AAC
CR45-B	Blue	2.0 AAC
CR45-W	White	2.0 AAC
CR45-Y	Yellow	2.0 AAC
CR45-A	Amber	2.0 AAC
MB45	Panel Mounting Bracket	



CR-45

The **CR45** Series, Wire Mounted Electrical Current Indicators provide 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.

Applications

Monitor Status of Heater Elements
Observe Remote Loads
Indicate Phase Loss
Monitor Motor Operation

Features

Self Powered
Red, Green, Blue, White, Yellow and Amber Indicators
Easy to Install
Supplied with a plastic wire tie
Bright Yellow Case for Easy Identification
Panel Mounting Bracket available

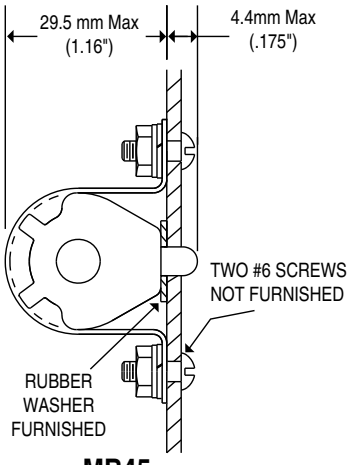
Specifications

100 AAC Max, 600 VAC Max rating
Thermoplastic Case Material
14.2 g / 0.5 oz weight
50 - 1Khz Bandwidth
-10°C to +85°C Operating Temperature
Mounting Bracket Non-Magnetic Aluminum Material
Weight 0.03 LBS.

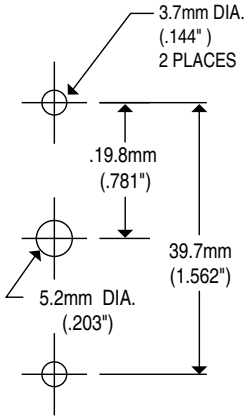
Regulatory Agencies

c UL us
E471882

RoHS



MB45



Recommended
Mounting Hole Pattern

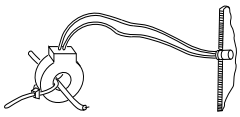
E

Indicators and Displays

PH Series

PH-25 Snap In

PH-31 Splash Proof



Model 19

Model 18 (w/ Bracket)

The **Remote Electrical Current Indicators** provide 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, green, blue, white, yellow or amber LEDs.

Applications

Monitor Status of Heater Elements
Observe Remote Loads
Indicate Phase Loss
Monitor Motor Operation

Features

Self Powered
Red, Green, Blue, White, Yellow and Amber Indicators
Panel Mounting Bracket available

Specifications

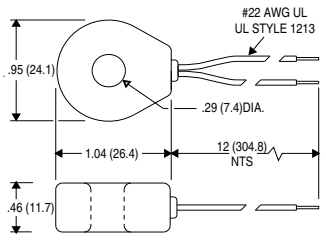
Model 18: 100 AAC Max, 600 VAC Max rating
Model 19: 25 AAC Max, 600 VAC Max Rating
50 - 1Khz Bandwidth
-10°C to +85°C Operating Temperature
Mounting Bracket Non-Magnetic Aluminum Material
Weight 0.03 LBS.

Regulatory Agencies

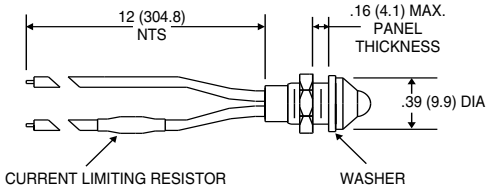
E235509

RoHS 2002/95/EC

PART NUMBERS			
Part Number	LED Color	Model 18 Turn On	Model 19 Turn On
PH-25-A	Amber	3.0 AAC	2.5 AAC
PH-25-B	Blue	2.5 AAC	2.0 AAC
PH-25-G	Green	3.0 AAC	2.5 AAC
PH-25-R	Red	2.5 AAC	2.0 AAC
PH-25-W	White	2.5 AAC	2.0 AAC
PH-25-Y	Yellow	2.5 AAC	2.0 AAC
PH-31-A	Amber	3.0 AAC	2.5 AAC
PH-31-B	Blue	2.5 AAC	2.0 AAC
PH-31-G	Green	3.0 AAC	2.5 AAC
PH-31-R	Red	2.5 AAC	2.0 AAC
PH-31-W	White	2.5 AAC	2.0 AAC
PH-31-Y	Yellow	2.5 AAC	2.0 AAC
Model 19	Wire Mount Current Transformer, 7.4mm window		
Model 18	Panel Mount Current Transformer, 14mm window		
MB-18	Panel Mounting Bracket for Model 18		

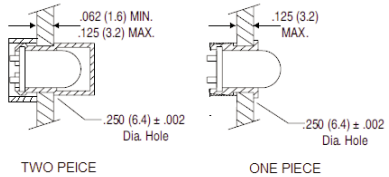


Model 19 Dimensions

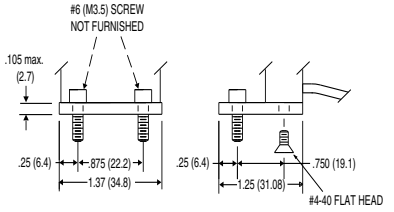


PH31 Dimensions

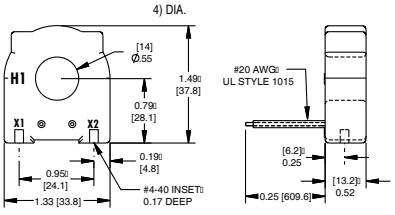
Bore Hole Size = 5/16"



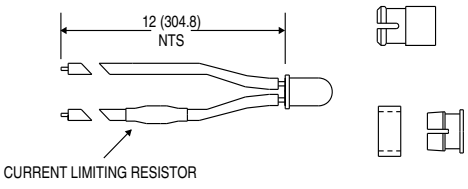
PH25 Mounting



MB-18 Dimensions



Model 18 Dimensions



PH25 Outline

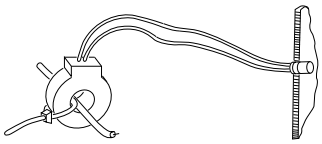
The Professional Energy Monitoring Company
CR MAGNETICS
ISO 9001:2008 Quality Management System
3500 Scarlet Oak Blvd. St. Louis MO USA 63122 V: 636-343-8518 F: 636-343-5119
Web: http://www.crmagnetics.com

E-mail: sales@crmagnetics.com

CR2530 Series

The **CR2530 Series** Remote Electrical Current Indicators are an economical method for providing a visual indication of current flow. The indicators are factory calibrated to provide a preset turn-on point. The value of the turn-on point is determined by the customer and specified in the part number. Attached to the transformer is a high efficiency, bi-polar LED that illimuminates when the current is above the turn-on point. The CR2530 standard lead length is 14 inches but can be customized to the customer's needs. Available LED bulb colors are Red, Green, Blue, White, Yellow and Amber.

Typical Installation



PART NUMBERS					
Part Number	Turn-On Point	LED Color	Lead Length		
CR2530					

R - Red
G - Green
B - Blue
W - White
Y - Yellow
A - Amber

Standard Lead Length is 14"
Custom ranges available

Standard Turn-on Points:
2.0, 5.0, 10, 20, 25, & 30 AAC
Custom ranges are available

Applications

Monitor Status of Heater Elements
Observe Remote Loads
Indicate Phase Loss
Monitor Motor Operation

Features

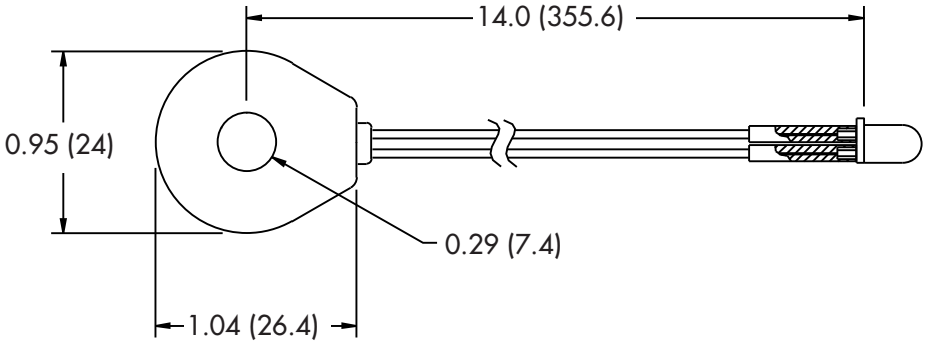
Self Powered
Preset Turn-on Point
Fully Isolated
Easy to install
Panel Mounting Bracket available for Current Transformer

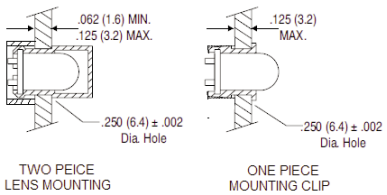
Specifications

Max Current:	100 AAC Max, 600 VAC Max Rating
Frequency	50 - 400 Hz Bandwidth
Operating Temperature	-30°C to +60°C
Storage Temperature	-55°C to +85°C
Optional Mounting Bracket Material	Non-Magnetic Aluminum
Weight	0.07 LBS.

Regulatory Agencies

RoHS 2002/95/EC





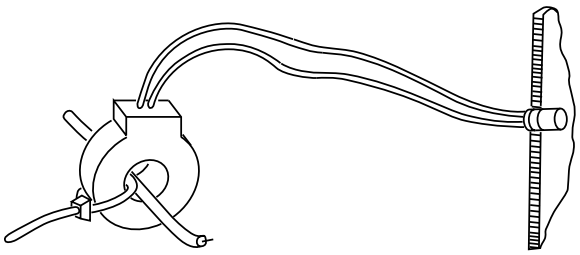
Bore Hole Size = 5/16"

Low Cost Remote Current Indicator

CR2550 Series

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, green, blue, white, amber or yellow LED indicator.

PART NUMBERS		
Part Number	LED Color	Turn On Point (1 pass)
CR2550-R	Red	0.75 AAC
CR2550-G	Green	1.5 AAC
CR2550-B	Blue	1.0 AAC
CR2550-W	White	0.75 AAC
CR2550-Y	Yellow	1.0 AAC
CR2550-A	Amber	1.5 AAC



Typical Installation

Applications
Monitor Status of Heater Elements
Observe Remote Loads
Indicate Phase Loss
Monitor Motor Operation

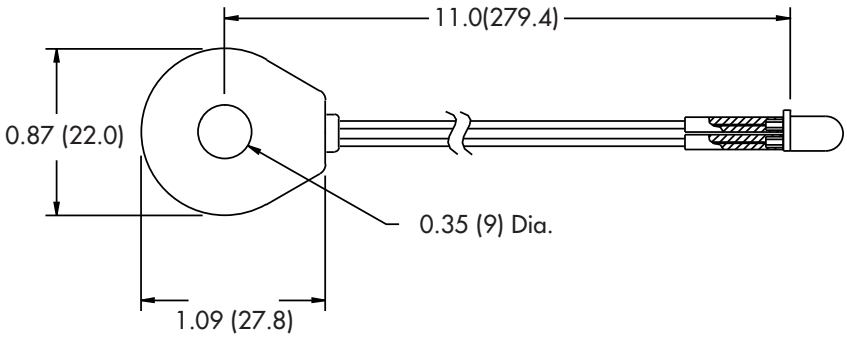
Features
Self Powered
Red, Green, Blue, White, Yellow and Amber Indicators
Low fixed trip point
Low Cost for high Volume OEM Applications

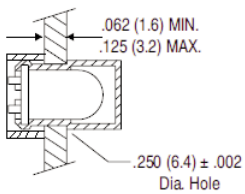
Specifications
20 AAC Max, 600 VAC Max rating
Thermoplastic Case Material
14.2 g / 0.5 oz weight
50 - 400 Hz Bandwidth
-30°C to +60°C Operating Temperature
-55°C to +85°C Storage Temperature
T-1 3/4, Bipolar, Red/Red or Green/Green Diffused, Indicator is supplied with LED attached to current sensing transformer. Supplied with both one-piece press in lens and two-piece mounting clip.
Weight 0.03 LBS.

Regulatory Agencies
c UL us E471882

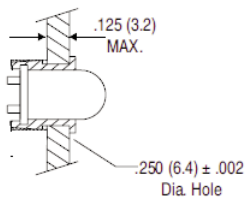
RoHS

-Available in Custom Lengths
Contact Factory for details





TWO PEICE
LENS MOUNTING



ONE PIECE
MOUNTING CLIP

CRM1000 Series

CRM2000 Series

CRM3000 Series

The **Current Mark Displays** are designed as a low cost method for providing a visual indication and measurement of electrical current flow. The current-carrying wire is routed through the window opening in the current sensing transformer, providing sensing and power for the instrument.
CRM1000 Series high efficiency, 7 LED indicator that illuminates as the current approachs the full scale range.
CRM2000 Series is a modern looking light bar with nice visual appeal. **CRM3000** Series is an auto-ranging display with an input range up to 50 AAC.

Applications

Monitor Status of Heater Elements
Observe Remote Loads
Indicate Phase Loss
Monitor Motor Operation

Features

Self Powered
Quick Visual Marking of AC Current
Compact
Low Cost for high Volume OEM Applications

Specifications

300AAC In-Rush 100AAC Continuous 50 AAC Rated
600 VAC Max rating
Thermoplastic Case Material
50/60 Hz Bandwidth*
-30°C to +60°C Operating Temperature
-55°C to +85°C Storage Temperature

* Contact Factory for additional input frequency ranges

Regulatory Agencies

RoHS 2002/95/EC
MADE IN USA
c UL us LISTED MEASURING EQUIPMENT 4ST7

PART NUMBERS				
CRM1000	-			7-LED Indicator
CRM2000	-			Light Bar
CRM3000	-	50		Auto Ranging to 50 AAC

Add suffix for input range

25 - 2-25 AAC
50 - 2-50 AAC

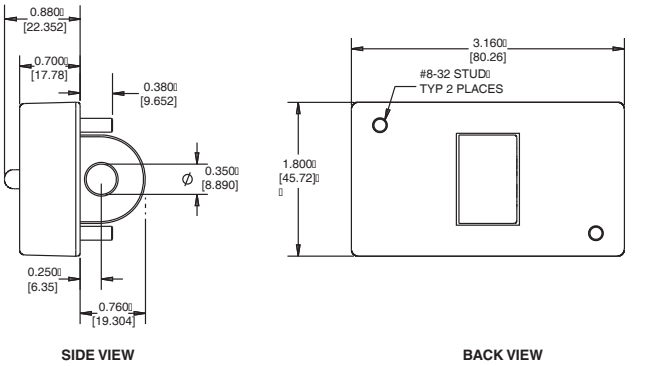
Current Transformer:

-I Internal

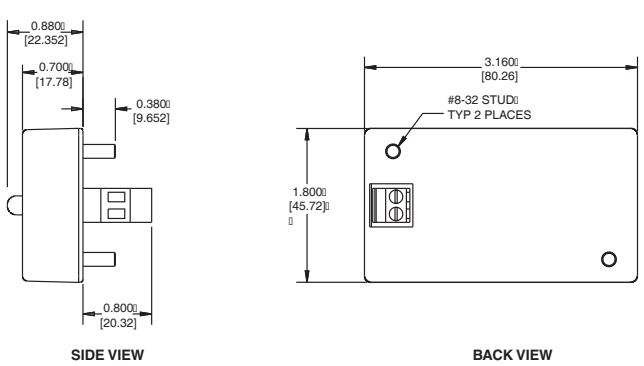
-R Remote Split CR3110-1500-36 (Included in Price)

CR3110-1500-36

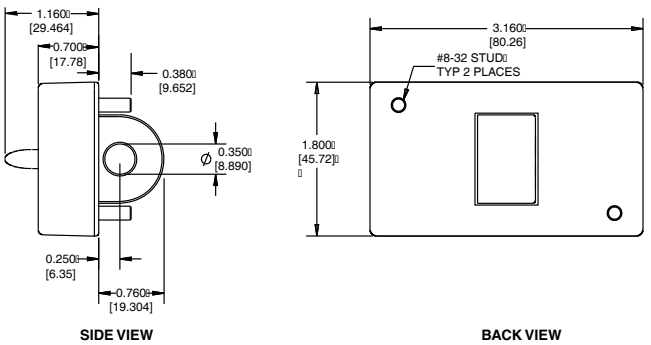
OUTLINE DRAWING



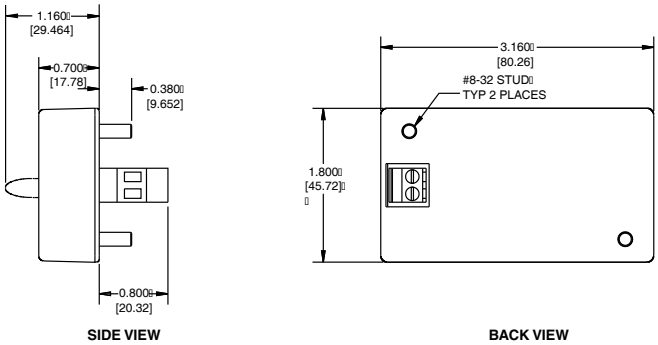
CRM1000 - I UNIT DIMENSIONS



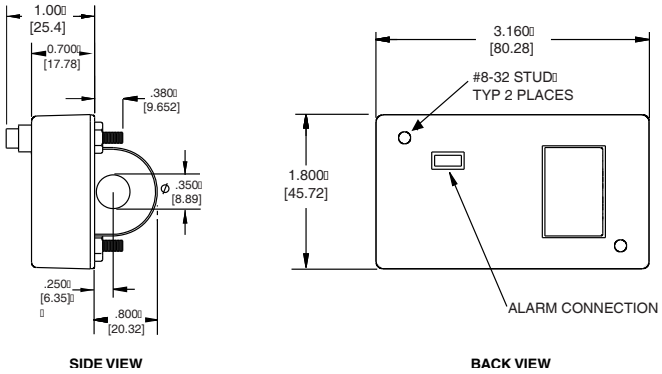
CRM1000 - R UNIT DIMENSIONS



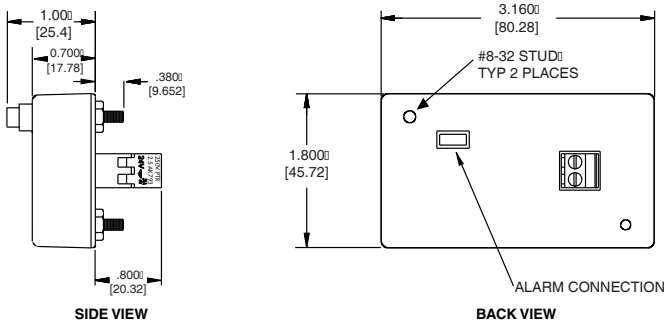
CRM2000 - I UNIT DIMENSIONS



CRM2000 - R UNIT DIMENSIONS



CRM3000-50-I UNIT DIMENSIONS

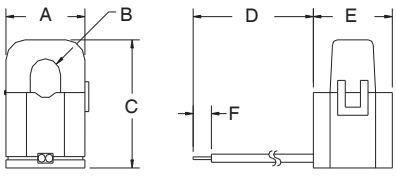


CRM3000-50-R UNIT DIMENSIONS

CRM3000 SPECIFICATIONS

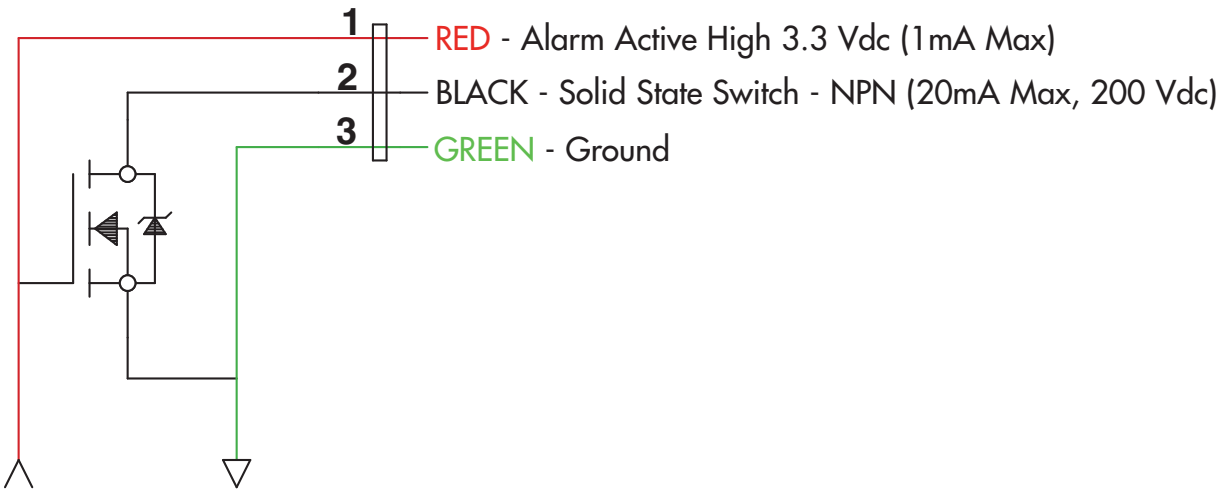
	CALIBRATION	LOW SCALE	HIGH SCALE	ACCURACY
CRM3000-50-I BASIC ACCURACY	10 AAC	9.9	10.1	1.0 %
	25 AAC	24.25	25.25	1.0 %
	50 AAC	49.50	50.50	1.0 %
CRM3000-50-R BASIC ACCURACY	10 AAC	9.8	10.2	2.0 %
	25 AAC	24.50	25.50	2.0 %
	50 AAC	49.00	51.00	2.0 %
READABLE RANGE FROM 2 AAC TO 51 AAC				

CR3110-1500-36
For Remote Application



PART NUMBER	A	B	C	D	E	F
CR3110-1500-36	1.04	0.40	1.58	36.0	1.04	0.24

CRM3000 CABLE ASSEMBLY CONNECTION DIAGRAM



ALARM PROGRAMMING AND OPERATING INSTRUCTIONS

Models:

CRM3000-50-I
CRM3000-50-R

1. Provide power to the unit.
2. Determine desired current level to activate alarm
3. Press and hold alarm button for two seconds and release
4. LCD display blinks either the last alarm setting or "Aoff".
   (Unit is factory set in "Aoff" mode)
5. Depress and release alarm button until desired set-point is reached
6. Press and hold alarm button for two seconds
7. Set-point is stored in memory and unit returns to normal operation
8. To deactivate alarm, press and hold alarm button for two seconds in "Aoff" mode

CRM3000 ALARM CABLE & PIN CONNECTOR (Optional)	
CRM3000-CBL-36	CRM3000 Alarm Cable Assembly 36" Lead

Current Transformers

CR Magnetics supplies an extensive line of current transformers for any need. With offerings measuring from 10,000 Amps to a few milliamps, we guarantee we will find a product that works for your application. Our facilities in the USA and Asia insure a low lead time on small and large quantity orders. We also maintain a healthy stock of the most popular sizes and current ratios.

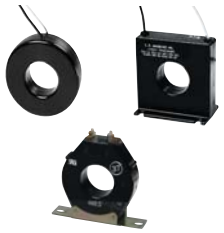
The CR8300 Series Current Transformers are printed circuit board mounted products designed to provide AC current measurement capability to any application. Typically high ratio devices, these products are designed to be applied to modern signal processing techniques and ICs to provide extremely accurate monitoring and measurement. Specific core and winding construction are available including nickel and nanocrystalline cores for power meter and ground fault applications, silicon steel core for standard applications, ferrite core for high frequency sensing, and a DC immune type core for dirty power measurement.

The CR8400 Current Transformers are wire lead, wire mount versions of the same transformers offered in the CR8300 series. Additionally, some special ratios are available for ground fault and indicator applications. Available in stock standard ratios, with fast turn around times for special designs.

ANSI and Commercial Class Current Transformers are standard 5 Amp secondary devices available in the most common footprints and mounting styles. Doughnut or Panel mounting, with leads or terminals are available. ANSI Class grades have been certified to meet most revenue grade meter requirements, and Commercial grade devices provide consistent, accurate monitoring for most industrial applications. Our short run capability is also available for unique non-standard ratio applications. Competitively priced, with UL, CSA, CE, and RoHS approvals.

Split Core and Horizontal Current Transformers are special packages provided for unique requirements. Split core devices allow the CT to be installed over existing power cables. Horizontal PC mount current transformers allow for unique wire placement within your products. Our most popular units are in stock, and we also offer quick turn around for custom designs.

ANSI & COMMERCIAL GRADE 5 AMP



WIRE MOUNTED WIRE LEADS

MEDIUM VOLTAGE WOUND PRIMARY

	CR1,2	CR2DA	CR5,6,7	CR8, 170	CR56,76	CR8300	CR8300G	CR8300N	CR8300F	CR8400	CR8400N	CR8400G	CR8400F	CR3100	610	613	600,601	17,18,19	CR8750	CTW3	CTW5	
ANSI Class		✔	✔	✔													✔			✔	✔	APPLICATION
Commercial Class	✔		✔													✔						
Power Meter		✔	✔	✔				✔			✔						✔		✔	✔	✔	
Current Meter	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	
Motor Current	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	
Ground Fault							✔					✔										
Indicator								✔		✔				✔				✔	✔			
High Frequency									✔				✔									
DC Immune						✔				✔												
Medium Voltage																				✔	✔	PACKAGE
5 Amp Secondary	✔	✔	✔	✔	✔											✔	✔			✔	✔	
High Ratio				✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			✔	✔		
Split Core														✔	✔	✔	✔					
PC Mount					✔	✔	✔	✔										✔	✔			
Wire Mount	✔	✔	✔	✔						✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	
Horizontal Mount																			✔			
Panel Mount	✔		✔	✔											✔	✔	✔	✔		✔	✔	
UL/CSA Approved	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	AGENCY
CE Approved	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔				✔	✔			
RoHS Compliant	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	

PRINTED CIRCUIT BOARD MOUNT

SPLIT CORE 5 AMP & HIGH RATIO

INDICATOR GENERAL PURPOSE

CR Magnetics supplies many products not shown here. High current CTs, special medium voltage CTs, and custom designs. Please contact the factory for details!

The Professional Energy Monitoring Company
CR MAGNETICS
ISO 9001:2008 Quality Management System
3500 Scarlet Oak Blvd. St. Louis MO USA 63122 V: 636-343-8518 F: 636-343-5119
Web: http://www.crmagnetics.com

E-mail: sales@crmagnetics.com

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 and out the H2 side
- \+ Wire from X1 terminal is routed through the H2 and out the H1 side

Example

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:

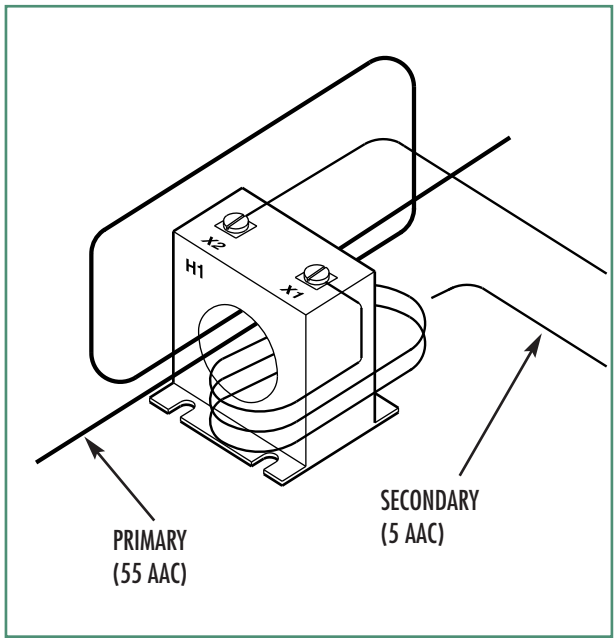
Nameplate ratio = 125 (125/5)

Number of secondary turns through window = - 3

Use -3 because the secondary wire is routed from X1 terminal first through the H1 side and out the H2 side

(Use + if the wire was routed first through the X2 side)

Number of primary turns through window = 2

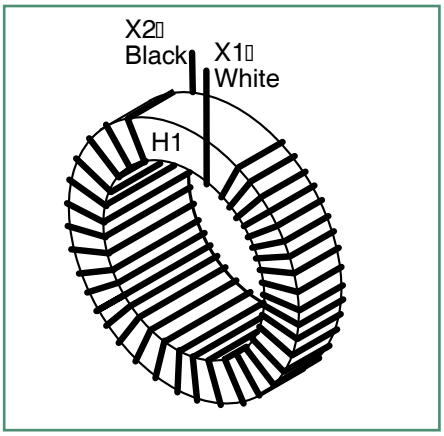


$$\frac{\frac{125}{5} - 3}{2} = 11$$

TURNS RATIO = 11:1
CURRENT RATIO = 55:5

Winding Polarity

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.



Window Openings

The current transformer window opening should be sized according to the outside diameter of the wire and the number of wires, with ample clearance added to facilitate installation.
Use the below formula for multiple wires of the same diameters through the current transformer window opening.

$$\text{Minimum Window Diameter} = K \times \text{Outside Wire Diameter}$$

Number of Wires Through Opening	K
2	2
3	2.165
4	2.414
5	2.704
6	3.0
7	3.0
8	3.73
9	3.83

Model 17, 18, 19 Series

Model 17 & 18
Shown with optional mounting bracket MB-18

Model 19

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 Models 17 and 18
Two case sizes, three different standard ratios

Specifications

Frequency: 50-60 Hz
Case Material: Black thermoplastic

Maximum Continuous Primary Current	4 X Ir
Insulation Voltage	3500 Vac/1min

Regulatory Agencies

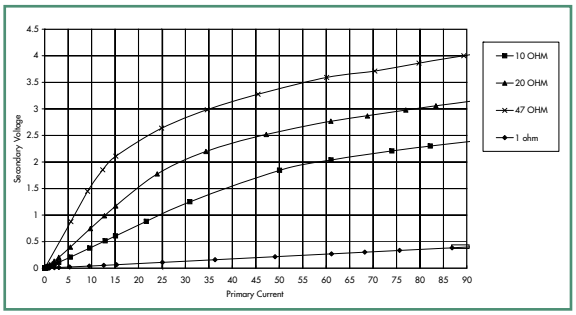
ORDER INFORMATION

Part Number	Description
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

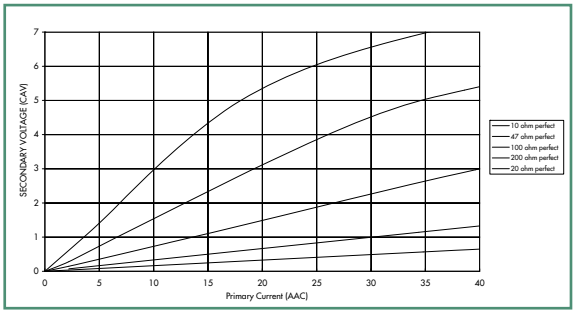
BASIC SPECIFICATIONS

Part Number	Imax	Vmax	Te (typ.)	DCR Ω	Frequency
Model 17-2000	200	10	2010	120	50 - 2KHz
Model 17-1000	200	7.5	1010	31	50 - 2KHz
Model 18-600	100	5	605	23	50 - 2KHz
Model 19	25	2	235	3	50 - 2KHz

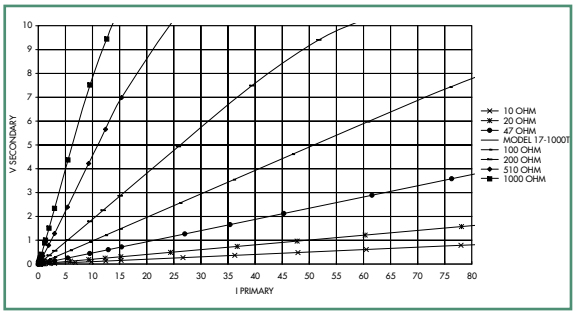
Outline Drawings



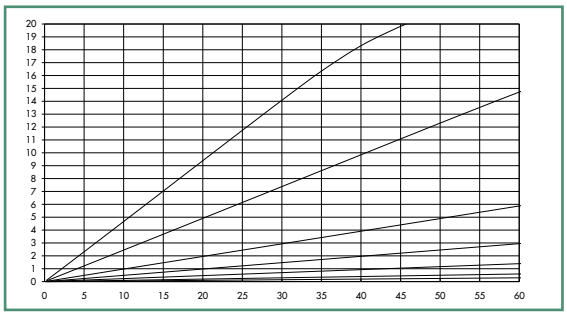
Model 19 - 230 Turns



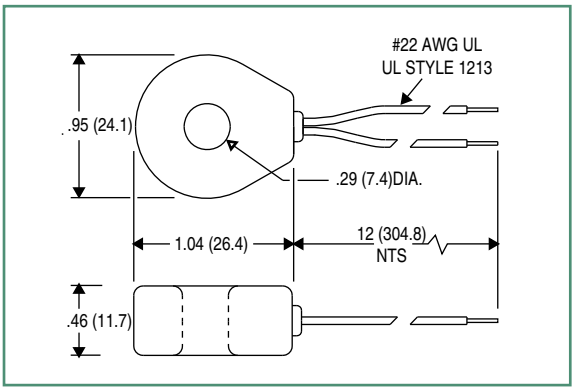
Model 18 - 600 Turns



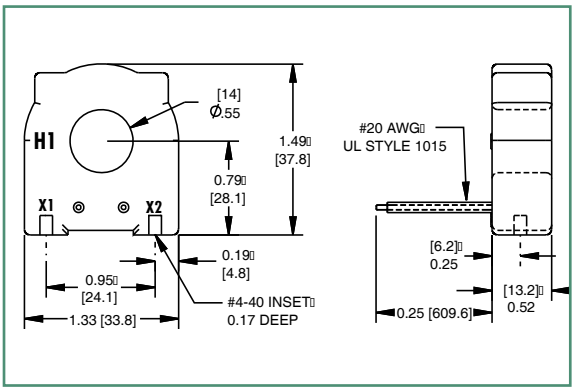
Model 17 - 1000 Turns



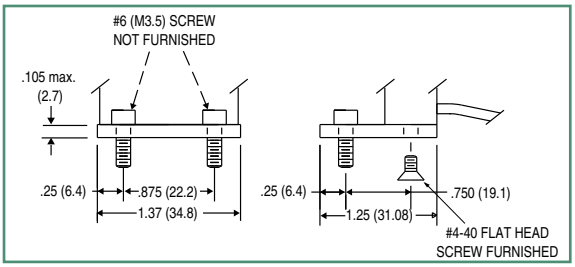
Model 17 - 2000 Turns



Model 19:
Current Sensing Transformer

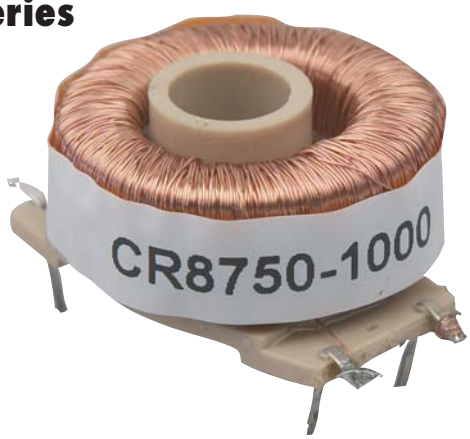


Model 17 & 18:
Current Sensing Transformers
Also available with PCB pins



MB-18: Surface Mounting Bracket
for Model 17 & Model 18

CR8750 Series



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 to the PCB. Two different winding ratios are available to accommodate various applications. The graph illustrates how different values of burden resistors attached to the output terminal will provide a number of different output voltage ranges.

Applications

Ammeters

Energy Measurement

Watt/VAR/Watthour measurement

Features

Low Cost

Core secured via Epoxy Resin

Hand Tuned Accuracy

Specifications

Frequency: 50-60 Hz

Case Material: Black thermoplastic

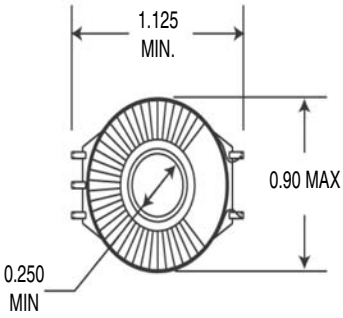
Maximum Continuous Primary Current	4 X Ir
Insulation Voltage	3500 Vac/1min

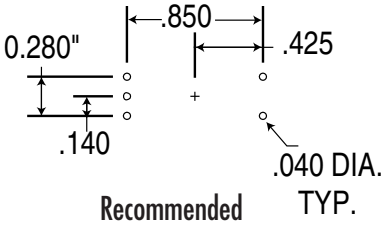
Regulatory Agencies

CR8750-230 ONLY

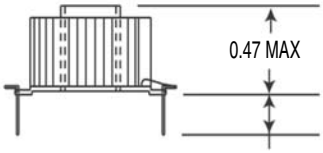
PART NUMBERS

PART NUMBER	TURNS
CR8750-230	230
CR8750-1000	1000



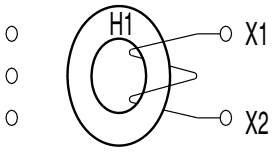


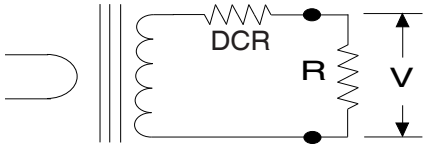
Recommended Mounting Hole Pattern (Top View)



Outline Drawing

Window Polarity (Top View)



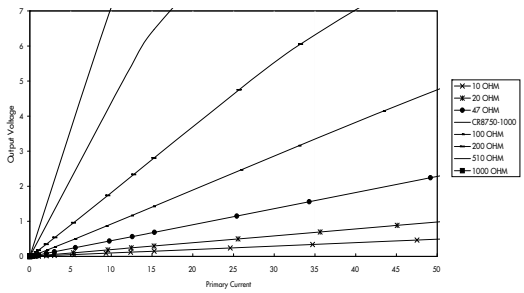


$$V = \frac{I \times R}{T_e} \qquad V_L = V_{max} - \frac{I \times DCR}{T_e}$$

For best linearity, choose R such that $V < 0.8\ V_L$

TYPICAL RESPONSE

CR8750-1000 Burden Chart



BASIC SPECIFICATIONS

Part Number	Imax	Vmax	Te (typ.)	DCR Ω	Frequency
CR8750-230	30	2	235	3	50 - 2KHz
CR8750-1000	60	6	1010	32	50 - 2KHz

High Ratio Vertical PCB Mount Current Transformer

CR Magnetics **CR8300** Series of PCB Mounted Current Transformers are available in a wide range of sizes and materials to meet any AC current sensing needs. Our **General Purpose** designs are made from the highest quality silicon steel cores available, and meet most of the common AC current measurement needs. Our **Revenue Grade (-N)** are made from a nickel alloy core which provides the most linear response over temperature and current level. A line of **Ground Fault (-G)** are for measuring low AC currents including electrical shields. **Nanocrystalline (-A)** is the most versatile providing accuracy, high saturation point and linear responses in high frequency applications. The **High Frequency (-F)** products are designed for high frequency applications such as high frequency power supplies and motor drives. CR Magnetics offers **DC Immune (-D)** models that are designed to provide sensing of AC currents where DC offsets also exist.

GENERAL PURPOSE VERTICAL PCB CURRENT TRANSFORMERS						
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR W**	**Frequency**	**Pin Diameter**
CR8320-1600	10	1.8	1613	95	20 - 1 KHz	0.8 X 4.0 MM
CR8348-1000	20	7.0	1023	24	20 - 1 KHz	1.0 X 3.0 MM
CR8348-2000	50	13.7	2046	106	20 - 1 KHz	1.0 X 3.0 MM
CR8349-1000	50	11.6	1016	35	20 - 1 KHz	1.0 X 6.0 MM
CR8349-1500	75	15.5	1520	80	20 - 1 KHz	1.0 X 4.0 MM
CR8350-1000	100	16.5	1021	22	20 - 1 KHz	1.0 X 3.0 MM
CR8350-2000	200	31.0	2037	73	20 - 1 KHz	1.0 X 3.0 MM
REVENUE GRADE VERTICAL PCB CURRENT TRANSFORMERS						
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR Ω**	**Frequency**	**Pin Diameter**
CR8348-2500-N	40	7.5	2510	134	20 - 1 KHz	1.0 X 3.0 MM
CR8349-1000-N	50	5.1	1009	32	20 - 1 KHz	1.0 X 3.0 MM
CR8349-2500-N	75	11.2	2512	190	20 - 1 KHz	1.0 X 3.0 MM
CR8350-2500-N	100	10.5	2511	57	20 - 1 KHz	1.0 X 6.0 MM
NANOCRYSTALLINE VERTICAL PCB CURRENT TRANSFORMERS						
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR Ω**	**Frequency**	**Pin Diameter**
CR8320-1600-A	10	3.0	1600	85	50 - 100 KHz	0.8 X 4.0 MM
CR8348-1000-A	20	6.0	1000	24	50 - 100 KHz	1.0 X 3.0 MM
CR8348-2000-A	50	10.0	2000	102	50 - 100 KHz	1.0 X 3.0 MM
CR8348-2500-A	40	13.0	2578	130	50 - 100 KHz	1.0 X 3.0 MM
CR8348-1000-A	50	4.1	1002	35	50 - 100 KHz	1.0 X 3.0 MM
CR8348-1500-A	75	6.0	1503	77	50 - 100 KHz	1.0 X 3.0 MM
CR8349-2000-A	75	8.0	2002	145	50 - 100 KHz	1.0 X 3.0 MM
CR8349-2500-A	75	1.0	2502	181	50 - 100 KHz	1.0 X 3.0 MM
CR8350-1000-A	100	10.0	1006	20	50 - 100 KHz	1.0 X 3.0 MM
CR8350-2000-A	100	25.0	2001	71	50 - 100 KHz	1.0 X 3.0 MM
CR8350-2500-A	100	21.0	2508	134	50 - 100 KHz	1.0 X 3.0 MM
HIGH FREQUENCY VERTICAL PCB CURRENT TRANSFORMERS						
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR Ω**	**Frequency**	**Pin Diameter**
CR8348-2000-F	50	3.7	2022	88	20 - 200KHz	1.0 X 6.0 MM
CR8349-2000-F	75	16.0	2024	109	20 - 200KHz	1.0 X 3.0 MM
CR8350-2000-F	100	10.0	2027	73	20 - 200KHz	1.0 X 3.0 MM
DC IMMUNE VERTICAL PCB CURRENT TRANSFORMERS						
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR Ω**	**Frequency**	**Pin Diameter**
CR8348-2000-D	50	4.0	2015	57	20 - 1 KHz	1.0 X 6.0 MM
CR8349-2000-D	75	7.6	2017	48	20 - 1 KHz	1.0 X 6.0 MM
CR8350-2000-D	100	6.3	2020	25	20 - 1 KHz	1.0 X 6.0 MM

I_r = Maximum Input Current to be linearly sensed V_{max} = Maximum Voltage (Saturation) CT will develop

T_e = Effective turns ratio including losses (All Specifications tested at 60 Hz)

PACKAGE AND PIN OUT DIMENSIONS (mm/in)								
Part Number Prefix	**A** min	**B** max	**C** max	**D** max	**E** ±0.3	**F** ±0.3	**G** ±0.3	**H** typ
CR8320	**5.5 .22**	**19.4 .76**	**19.5 .77**	**8.2 .32**	**12.7 .50**	**N/A**	**N/A**	**4.0 .16**
CR8348	**6.7 .27**	**23.5 .93**	**25 .98**	**11 .43**	**15.2 .60**	**9.5 .37**	**19 .75**	**1.90 .07**
CR8349	**9 .35**	**26 1.02**	**28 1.10**	**17 .67**	**15.2 .60**	**15.5 .61**	**19 .75**	**1.90 .07**
CR8350	**12.8 .50**	**37.5 1.48**	**39 1.54**	**14 .55**	**25.4 1.00**	**12.7 .50**	**33.02 1.30**	**3.81 .15**

CR8300 SERIES

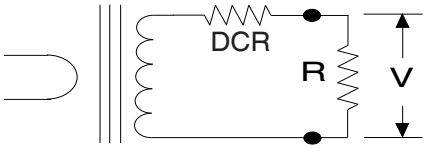
Applications
Motor Load Measurement
Power Meters
High Frequency Current Sensing

Features
High Ratio
Standard Footprints

Specifications

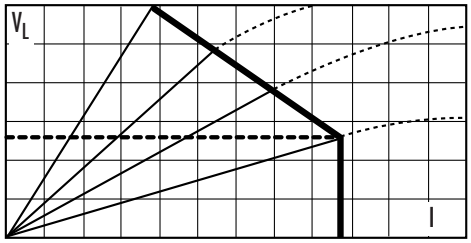
Maximum Continuous Primary Current	4 X Ir
Insulation Voltage	3500 Vac/1min
Storage Temp.	-45°C thru +85 °C
Operating Temp. General Purpose & Nickel	-40°C thru +85 °C
Operating Temp. High Frequency	-40°C thru +65 °C

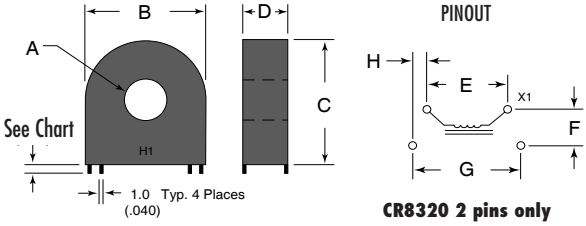
Regulatory Agencies



$$V = \frac{I \times R}{T_e} \qquad V_L = Vmax - \left[\frac{I \times DCR}{T_e} \right]$$

For best linearity, choose R such that $V < 0.8\ V_L$





CR8320 2 pins only

CR Magnetics **CR8400** Series of Wire Lead Current Transformers are available in a wide range of sizes and materials to meet any AC current sensing needs. Our **General Purpose** designs are made from the highest quality silicon steel cores available, and meet most of the common AC current measurement needs. Our **Revenue Grade (-N)** are made from a nickel alloy core which provides the most linear response over temperature and current level. A line of **Ground Fault (-G)** are for measuring low AC currents including electrical shields. **Nanocrystalline (-A)** is the most versatile providing accuracy, high saturation point and a linear response in high frequency applications. The **High Frequency (-F)** products are designed for high frequency applications such as high frequency power supplies and motor drives.

GENERAL PURPOSE CURRENT TRANSFORMERS					
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR Ω**	**Frequency**
CR8401-1000	10	2.2	1009	49	20 - 1 KHz
CR8410-1000	20	3.1	1012	41	20 - 1 KHz
CR8420-1000	50	5.2	1018	22	20 - 1 KHz
CR8420-2000	75	9.0	1983	90	20 - 1 KHz
CR8448-1000	30	6.3	990	26	20 - 1 KHz
CR8448-2000	50	13.7	2046	106	20 - 1 KHz
CR8449-1000	50	11.6	1016	35	20 - 1 KHz
CR8449-2000	75	23	2046	150	20 - 1 KHz
CR8450-1000	100	16.5	1021	21	20 - 1 KHz
CR8450-2000	200	32	2037	73	20 - 1 KHz
REVENUE GRADE CURRENT TRANSFORMERS					
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR Ω**	**Frequency**
CR8448-2500-N	40	6.6	2510	134	20 - 1 KHz
CR8449-2500-N	50	10.0	2490	187	20 - 1 KHz
CR8450-2500-N	75	12.0	2512	143	20 - 1 KHz
CR8459-2000-N	200	11.5	2011	74	20 - 1 KHz
GROUND FAULT CURRENT TRANSFORMERS					
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR Ω**	**Frequency**
CR8401-1000-G	4	0.6	1005	49	20 - 1 KHz
CR8410-1000-G	7	0.8	1007	38	20 - 1 KHz
CR8420-1000-G	20	1.4	1011	44	20 - 1 KHz
NANOCRYSTALLINE CURRENT TRANSFORMERS					
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR Ω**	**Frequency**
CR8401-1000-A	4	1.2	1034	43	50 - 100 KHz
CR8410-1000-A	7	1.5	1015	39	50 - 100 KHz
CR8420-1000-A	20	1.8	1023	43	50 - 100 KHz
CR8420-2000-A	75	4.0	2010	89	50 - 100 KHz
CR8448-1000-A	30	5.0	1000	25	50 - 100 KHz
CR8448-2000-A	50	10.0	2000	103	50 - 100 KHz
CR8448-2500-A	40	11.0	2524	131	50 - 100 KHz
CR8449-1000-A	50	7.0	1002	35	50 - 100 KHz
CR8449-2000-A	75	11.0	2013	144	50 - 100 KHz
CR8449-2500-A	50	20.0	2501	182	50 - 100 KHz
CR8450-1000-A	100	13.0	1003	21	50 - 100 KHz
CR8450-2000-A	100	19.0	2000	72	50 - 100 KHz
CR8450-2500-A	75	22.0	2501	134	50 - 100 KHz
CR8459-2000-A	200	23.0	2001	73	50 - 100 KHz
HIGH FREQUENCY CURRENT TRANSFORMERS					
Part Number	**I_r**	**Vmax RMS**	**Te (typ.)**	**DCR Ω**	**Frequency**
CR8448-2000-F	50	3.9	2015	90	20 - 200 KHz
CR8449-2000-F	75	7.4	2017	109	20 - 200 KHz
CR8450-2000-F	100	8.5	2020	63	20 - 200 KHz

I_r = Maximum Input Current to be linearly sensed V_{max} = Maximum Voltage (Saturation) CT will develop

T_e = Effective turns ratio including losses (All Specifications tested at 60 Hz)

PACKAGE DIMENSIONS AND OUTLINE (mm/in)

Part Number Prefix	A min	B max	C max	D max	E Typ
CR8401	6.99 .275	17.53 .690	22.35 .880	8.26 .325	75.08 2.275
CR8410	9.0 .35	22 .87	27.8 1.09	8.20 .323	73 2.87
CR8420	15.0 .59	30.0 1.18	36.0 1.41	9.2 .36	100 3.94
CR8448	7.11 .280	23.42 .922	29.46 1.16	11.05 .435	100 3.94
CR8449	9.14 .354	26.0 1.02	31.8 1.25	17.0 .67	100 3.94
CR8450	13.08 .515	36.83 1.45	43.18 1.70	13.97 .55	88.9 3.50
CR8459	19 .75	48 1.89	60 2.36	17.5 .67	200 7.88

CR8400 SERIES

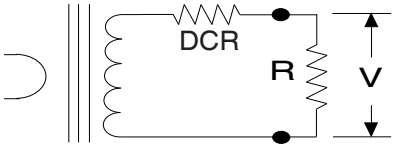
Applications
Motor Load Measurement
Power Meters
High Frequency Current Sensing
Ground Fault Sensing

Features
High Ratio
Custom Lead Lengths Available

Specifications

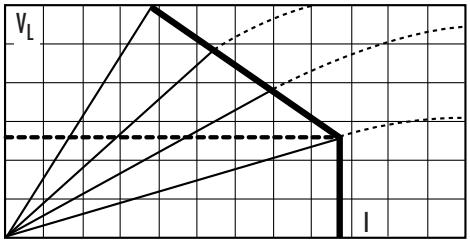
Maximum Continuous Primary Current	4 X Ir
Insulation Voltage	3500 Vac/1min
Storage Temp.	-45°C thru +85 °C
Operating Temp. General Purpose & Nickel	-40°C thru +85 °C
Operating Temp. High Frequency	-40°C thru +65 °C

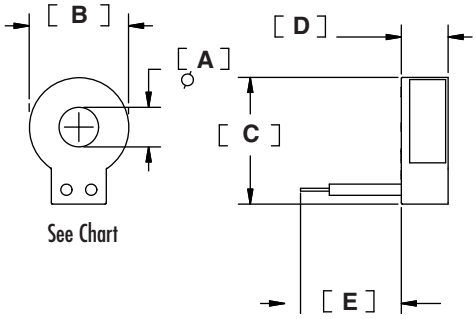
Regulatory Agencies



$$V = \frac{I \times R}{T_e} \qquad V_L = V_{max}\left[1 - \frac{I \times DCR}{T_e}\right]$$

For best linearity, choose R such that $V < 0.8\ V_L$






RL


SFT


SFL


SHT


SHL


RT


RBT


RBL

Applications

Ammeters

Energy Measurement

Watt/VAR/Watthour Measurement

Current Sensing Relays

Features

Low Cost

Core Secured via Epoxy Resin

Hand Tuned Accuracy

Common Ratios in Stock

Regulatory Agencies

BASIC SPECIFICATIONS

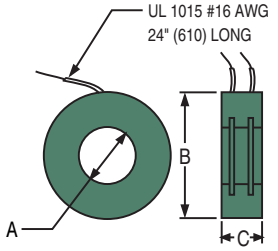
Basic Accuracy	10% FS or Better (ANSI)
Thermal Drift	100 PPM/°C
Operating Temperature	-20° C to +75° C
Installation Category	CAT II
Pollution Degree	2
Insulation Voltage	3500 Vac/1min
Frequency Range	50Hz - 400Hz
Torque Spec on Studs	10 in/lb.

CUSTOM OPTIONS

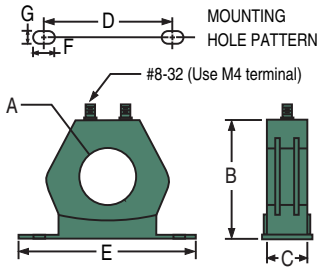
Ultra-Low Frequency to 20 Hz
1.0, 0.2,and 0.1 Amp Secondary Ratios

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.

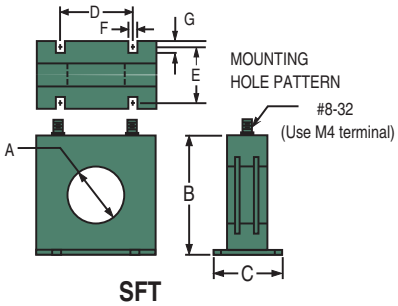
DIMENSIONS



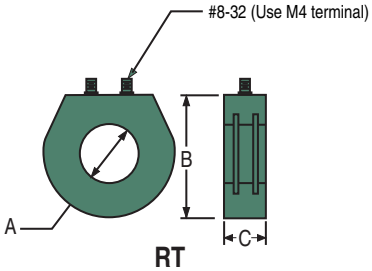
RL



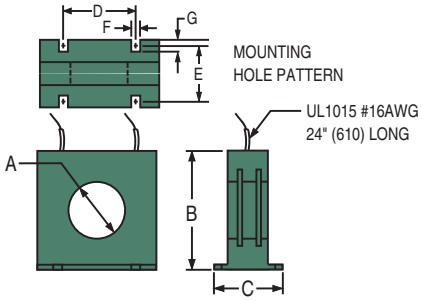
RBT



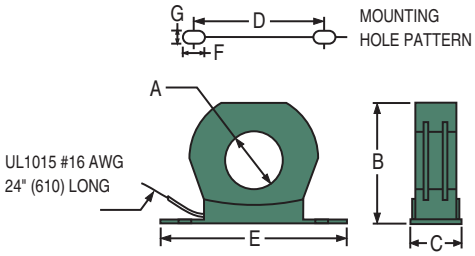
SFT



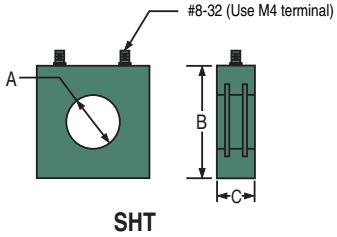
RT



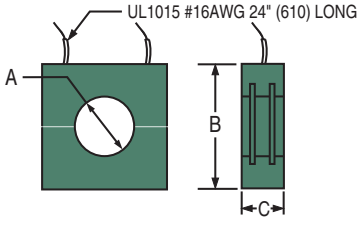
SFL



RBL



SHT



SHL

Commercial Class Current Transformers

PART NUMBERS			DIMENSIONS							ACCURACY SPECIFICATIONS		
SERIES	STYLE	RATIO SUFFIX	A	B	C	D	E	F	G	CURRENT RATIO	ACCURACY AT 60HZ	BURDEN VA AT 60 HZ
CR2	RL	500	1.13 (28.7)	2.46 (62.5)	1.05 (26.7)					50:5	± 3%	2.0
		600								60:5	± 2%	2.0
	SFT	750		2.68 (68.1)	2.00 (50.8)	1.75 (44.5)	1.75 (44.5)	.27 (6.9)	.31 (7.9)	75.5	± 2%	2.0
		800								80:5	± 2%	2.0
	SFL	101		2.68 (68.1)	2.00 (50.8)	(1.75 (44.5)	1.75 (44.5)	.27 (6.9)	.31 (7.9)	100:5	± 1%	2.0
		121								120:5	± 1%	2.5
	SHT	1250		2.71 (68.8)	0.95 (24.1)					125:5	± 1%	2.5
		151								150:5	± 1%	4.0
	SHL	201		2.71 (68.8)	0.95 (24.1)					200:5	± 1%	4.0
		251								250:5	± 1%	6.0
		301								300:5	± 1%	8.0
CR5	RL	500	1.56 (39.6)	3.56 (90.4)	1.10 (27.9)					50:5	± 2%	1.0
		750								75.5	± 2%	1.5
	SFT	101		3.78 (96.0)	2.15 (54.6)	2.75 (69.9)	1.77 (45.0)	.21 (5.3)	.31 (7.9)	100:5	± 2%	2.0
		151								150:5	± 1%	5.0
	SFL	201		3.78 (96.0)	2.15 (54.6)	2.75 (69.9)	1.77 (45.0)	.21 (5.3)	.31 (7.9)	200:5	± 1%	5.0
		251								250:5	± 1%	10.0
	SHT	301		3.83 (97.3)	1.09 (27.7)					300:5	± 1%	12.5
		401								400:5	± 1%	12.5
	SHL	501		3.83 (97.3)	1.09 (27.7)					500:5	± 1%	20.0
		601								600:5	± 1%	25.0
	RT	751		3.62 (91.9)	1.13 (28.7)					750:5	± 1%	25.0
		801								800:5	± 1%	25.0
	RBT*	102		3.90 (99.1)	1.25 (31.8)	3.88 (98.6)	4.50 (114.3)	.44 (11.2)	.27 (6.9)	1000:5	± 1%	25.0
		122								1200:5	± 1%	30.0
	RBL*	152		3.70 (94.0)	1.25 (31.8)	3.88 (98.6)	4.50 (114.3)	.44 (11.2)	.27 (6.9)	1500:5	± 1%	40
		162								1600:5	± 1%	40
CR7	RL	101	2.50 (63.5)	4.70 (919.4)	1.10 (27.4)					100:5	± 2%	2.5
		151								150:5	± 1%	5.0
	SFT	201		4.85 (123.2)	2.13 (54.1)	3.78 (96.0)	1.75 (44.5)	.25 (6.4)	.31 (7.9)	200:5	± 1%	5.0
		251								250:5	± 1%	5.0
	SFL	301		4.85 (123.2)	2.13 (54.1)	3.78 (96.0)	1.75 (44.5)	.25 (6.4)	.31 (7.9)	300:5	± 1%	12
		401								400:5	± 1%	15
	SHT	501		4.70 (119.4)	1.10 (27.9)					500:5	± 1%	25
		601								600:5	± 1%	30
	SHL	751		4.70 (119.4)	1.10 (27.9)					750:5	± 1%	30
		801								800:5	± 1%	35
	RT	102		4.61 (117.1)	1.10 (27.9)					1000:5	± 1%	30
		122								1200:5	± 1%	35
	RBT	152		4.94 (125.5)	1.25 (31.8)	5.75 (146.1)	6.5 (7.1)	.28 (16.5)	.28 (7.1)	1500:5	± 1%	40
		162								1600:5	± 1%	40
	RBL			4.70 (125.5)	1.25 (31.8)	5.75 (146.1)	6.5 (16.5)	.28 (7.1)	.28 (7.1)			

PART NUMBERS			DIMENSIONS							ACCURACY SPECIFICATIONS		
SERIES	STYLE	RATIO SUFFIX	A	B	C	D	E	F	G	CURRENT RATIO	ACCURACY AT 60HZ	BURDEN VA AT 60 HZ
CR56	RL	500	2.06 (52.3)	3.50 (88.9)	1.09 (27.7)	2.70 (68.6)	1.70 (43.2)	.21 (5.3)	.31 (7.9)	50:5	± 3%	2.0
		750								75.5	± 1%	0.5
	SFT	101		3.63 (92.2)	2.15 (54.6)	2.70 (68.6)	1.70 (43.2)	.21 (5.3)	.31 (7.9)	100:5	± 1%	1.0
		151								150:5	± 1%	2.5
		201								200:5	± 1%	4.0
	SFL	251		3.63 (92.2)	2.15 (54.6)					250:5	± 1%	6.0
		301								300:5	± 1%	7.5
	RT	401		3.62 (91.9)	1.10 (27.9)					400:5	± 1%	10.0
		501								500:5	± 1%	12.5
	RBT	601		3.90 (99.1)	1.25 (31.8)	3.88 (98.6)	4.50 (114.3)	.27 (6.9)	.44 (11.2)	600:5	± 1%	15.0
		751								750:5	± 1%	7.0
		801								800:5	± 1%	8.0
	RBL	102		3.70 (94.0)	1.25 (31.8)	3.88 (98.6)	4.50 (114.3)	.27 (6.9)	.44 (11.2)	1000:5	± 1%	10.0
		122								1200:5	± 1%	12.5
CR76	RL	201	3.00 (76.2)	4.50 (114.3)	1.09 (27.7)					200:5	± 1%	5.0
		251								250:5	± 1%	5.0
	SFT	301		4.68 (128.9)	2.08 (52.8)	3.70 (44.0)	1.75 (44.5)	.25 (6.4)	.31 (7.9)	300:5	± 1%	6.0
		401								400:5	± 1%	10.0
	SFL	501		4.68 (118.9)	2.08 (52.8)	3.70 (44.0)	1.75 (44.5)	.25 (6.4)	.31 (7.9)	500:5	± 1%	10.0
		601								600:5	± 1%	10.0
		751								750:5	± 1%	10.0
	RT	801		4.62 (117.3)	1.10 (27.9)					800:5	± 1%	12.5
		102								1000:5	± 1%	10.0
	RBT	122		4.94 (125.5)	1.25 (31.8)	5.75 (146.1)	6.50 (165.1)	.28 (7.1)	.28 (7.1)	1200:5	± 1%	10.0
		152								1500:5	± 1%	12.5
		162								1600:5	± 1%	12.5
	RBL	202		4.70 (119.4)	1.25 (31.8)	5.75 (146.1)	6.50 (165.1)	.28 (7.1)	.28 (7.1)	2000:5	± 1%	15.0
CR1A	RL	500	.64 (16.3)	1.99 (31.8)	1.25 (31.8)					50:5	± 2%	1.0
		600								60:5	± 1%	2.0
		750								75.5	± 1%	2.0
		800								80:5	± 1%	2.0
		101								100:5	± 1%	2.5
		121								120:5	± 1%	3.0
		1250								125:5	± 1%	3.0
		151								150:5	± 1%	4.0
		201								200:5	± 1%	5.0
		251								250:5	± 1%	7.5

ANSI Metering Class Current Transformers

PART NUMBERS			DIMENSIONS							ANSI METERING CLASS @ 60 HZ					
SERIES	STYLE	RATIO SUFFIX	A	B	C	D	E	F	G	CURRENT RATIO	B0.1	B0.2	B0.5	B0.9	B1.8
CR2DA	RL	500	1.0 (25.4)	2.47 (62.7)	1.75 (44.5)					50:5	4.8	-	-	-	-
		600								60:5	1.2	4.8	-	-	-
		750								75:5	1.2	2.4	-	-	-
		800								80:5	1.2	2.4	4.8	-	-
		101								100:5	1.2	2.4	4.8	-	-
		121								120:5	1.2	2.4	2.4	4.8	-
		1250								125:5	0.6	1.2	2.4	4.8-	-
		151								150:5	0.6	0.6	1.2	2.4	4.8
		201								200:5	0.3	0.3	1.2	1.2	2.4
		251								250:5	0.3	0.3	0.6	1.2	2.4
		301								300:5	0.3	0.3	0.6	0.6	1.2
CR5A	RL	500	1.56 (39.6)	3.56 (90.4)	1.10 (27.9)	2.75 (69.9)	1.77 (45.0)	.21 (5.3)	.31 (7.9)	50:5	4.8	-	-	-	-
		101								100:5	2.4	4.8	-	-	-
		151								150:5	0.6	1.2	2.4	4.8	-
	SFT	201		3.77 (95.8)	2.15 (54.6)					200:5	0.6	0.6	1.2	2.4	4.8
		251								250:5	0.6	0.6	1.2	2.4	2.4
		301								300:5	0.3	0.3	0.6	1.2	2.4
	SFL	401		3.77 (95.4)	2.15 (54.6)					400:5	0.3	0.3	0.6	1.2	1.2
		501								500:5	0.3	0.3	0.6	0.6	1.2
	SHT	601		3.70 (94.0)	1.10 (27.9)	2.75 (69.9)	1.77 (45.0)	.21 (5.3)	.31 (7.9)	600:5	0.3	0.3	0.3	0.6	1.2
		751								750:5	0.3	0.3	0.3	0.6	0.6
		801								800:5	0.3	0.3	0.3	0.6	0.6
	SHL	102		3.70 (94.0)	1.10 (27.9)					1000:5	0.3	0.3	0.3	0.3	0.6
		122								1200:5	0.3	0.3	0.3	0.3	0.3
CR6A	RL	101	2.06 (52.3)	4.08 (103.6)	1.10 (27.9)	3.34 (84.8)	1.75 (44.5)	.25 (6.4)	.31 (7.9)	100:5	1.2	2.4	-	-	-
		151								150:5	1.2	1.2	2.4	4.8	-
		201								200:5	0.6	1.2	2.4	2.4	4.8
	SFT	251		4.21 (106.9)	2.12 (54.6)					250:5	0.3	0.6	1.2	2.4	4.8
		301								300:5	0.3	0.3	1.2	2.4	2.4
		401								400:5	0.3	0.3	0.6	1.2	1.2
	SFL	501		4.21 (106.9)	2.12 (54.6)					500:5	0.3	0.3	0.6	1.2	1.2
		601								600:5	0.3	0.3	0.6	0.6	1.2
		751								750:5	0.3	0.3	0.3	0.6	1.2
	SHT	801		4.22 (107.2)	1.10 (27.9)					800:5	0.3	0.3	0.3	0.6	0.6
		102								1000:5	0.3	0.3	0.3	0.3	0.6
		122								1200:5	0.3	0.3	0.3	0.3	0.3
	SHL	152		4.22 (107.2)	1.10 (27.9)					1500:5	0.3	0.3	0.3	0.3	0.3

PART NUMBERS			DIMENSIONS							ANSI METERING CLASS @ 60 HZ					
SERIES	STYLE	RATIO SUFFIX	A	B	C	D	E	F	G	CURRENT RATIO	B0.1	B0.2	B0.5	B0.9	B1.8
CR7A	RL	101	2.50 (63.5)	4.70 (119.4)	1.10 (27.9)	3.78 (96.0)	1.75 (44.5)	.25 (6.4)	.31 (7.9)	100:5	1.2	4.8	-	-	-
		151								150:5	0.6	1.2	4.8	4.8	-
		201								200:5	0.6	1.2	2.4	4.8	4.8
	SFT	251		4.85 (123.2)	2.13 (54.1)					250:5	0.3	0.6	1.2	2.4	4.8
		301								300:5	0.3	0.3	1.2	2.4	2.4
		401								400:5	0.3	0.3	0.6	1.2	2.4
	SFL	501								500:5	0.3	0.3	0.6	1.2	1.2
		601								600:5	0.3	0.3	0.6	0.6	1.2
		751								750:5	0.3	0.3	0.6	0.6	0.6
	SHT	801		4.70 (119.4)	1.10 (27.9)					800:5	0.3	0.3	0.3	0.6	0.6
		102								1000:5	0.3	0.3	0.3	0.6	0.6
		122								1200:5	0.3	0.3	0.3	0.3	0.6
	SHL	152		4.70 (119.4)	1.10 (27.9)					1500:5	0.3	0.3	0.3	0.3	0.3
		162								1600:5	0.3	0.3	0.3	0.3	0.3
CR8	RL	201	3.25 (82.6)	5.73 (145.5)	1.15 (29.2)					200:5	1.2	1.2	2.4	4.8	4.8
		251								250:5	0.6	0.6	1.2	2.4	4.8
		301								300:5	0.6	0.6	1.2	2.4	2.4
		401								400:5	0.3	0.3	0.6	1.2	2.4
		501								500:5	0.3	0.3	0.6	0.6	1.2
		601								600:5	0.3	0.3	0.6	0.6	1.2
		751								750:5	0.3	0.3	0.3	0.6	1.2
	SHT	801								800:5	0.3	0.3	0.3	0.6	0.6
		102								1000:5	0.3	0.3	0.3	0.3	0.6
		122								1200:5	0.3	0.3	0.3	0.3	0.3
		152								1500:5	0.3	0.3	0.3	0.3	0.3
		162								1600:5	0.3	0.3	0.3	0.3	0.3
		202								2000:5	0.3	0.3	0.3	0.3	0.3
		252								2500:5	0.3	0.3	0.3	0.3	0.3
		302								3000:5	0.3	0.3	0.3	0.3	0.3
	SHL	322		5.73 (145.5)	1.15 (29.2)					3200:5	0.3	0.3	0.3	0.3	0.3
		402								4000:5	0.3	0.3	0.3	0.3	0.3
CR170	RL	201	4.25 (108)	6.73 (170.9)	1.25 (31.8)					200:5	0.6	1.2	2.4	-	-
		251								250:5	0.6	0.6	1.2	2.4	-
		301								300:5	0.6	0.6	1.2	2.4	-
		401								400:5	0.3	0.3	0.6	1.2	2.4
		501								500:5	0.3	0.3	0.6	1.2	1.2
		601								600:5	0.3	0.3	0.6	0.6	1.2
		751								750:5	0.3	0.3	0.3	0.3	0.6
	SHT	801								800:5	0.3	0.3	0.3	0.3	0.6
		102								1000:5	0.3	0.3	0.3	0.3	0.6
		122								1200:5	0.3	0.3	0.3	0.3	0.6
		152								1500:5	0.3	0.3	0.3	0.3	0.6
		162								1600:5	0.3	0.3	0.3	0.3	0.6
		202								2000:5	0.3	0.3	0.3	0.3	0.3
		252								2500:5	0.3	0.3	0.3	0.3	0.3
		302								3000:5	0.3	0.3	0.3	0.3	0.3
	SHL	322		6.73 (170.9)	1.28 (32.5)					3200:5	0.3	0.3	0.3	0.3	0.3
		402								4000:5	0.3	0.3	0.3	0.3	0.3

CR3100 Series

CR3109-1500

CR3110-3000

CR3111-3000

CR3113-2000

The **CR3100** Series Split Core Current Transformer is designed to provide a low cost method to monitoring electrical current. A unique hinge and locking snap allows attachment without interrupting the current-carrying wire. High secondary turn will develop signals up to 10.0 VAC across a burden resistor.

Applications

Portable Instruments
Sub-Metering
Monitor Motor Loads

Features

Small Size
Low Cost
High Secondary Turns
Secure Locking Hinge

Specifications

Maximum Continuous Primary Current	4 X Ir
Insulation Voltage	3500 Vac/1min
Storage Temp.	-45°C thru +85°C
Operating Temp.	-40°C thru +65 °C

Regulatory Agencies

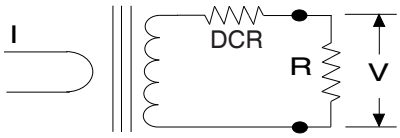
CR3110-3000 ONLY

PART NUMBERS	
CR3109 - 1500	30 AMP
CR3110 - 3000	75 AMP
CR3111 - 3000	100 AMP
CR3113 - 2000	150 AMP

SPLIT CORE CURRENT TRANSFORMERS

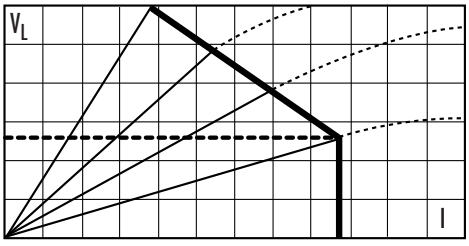
Part Number	Imax	Vmax RMS	Te (typ.)	DCR Ω	Frequency
CR3109-1500	30	5	1510	187	20 - 1 KHz
CR3110-3000	75	15	3100	515	20 - 1 KHz
CR3111-3000	100	19	3150	390	20 - 1 KHz
CR3113-2000	150	16	2125	58	20 - 1 KHz

I_r = Maximum Input Current to be linearly sensed V_{max} = Maximum Voltage (Saturation) CT will develop
T_e = Effective turns ratio including losses (All Specifications tested at 60 Hz)

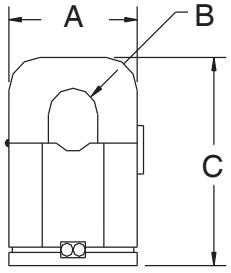


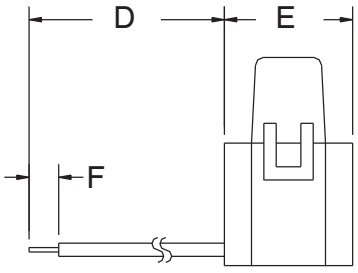
$$V = \frac{I \times R}{T_e} \qquad V_L = Vmax - \left[\frac{I \times DCR}{T_e} \right]$$

For best linearity, choose R such that $V < 0.8\ V_L$



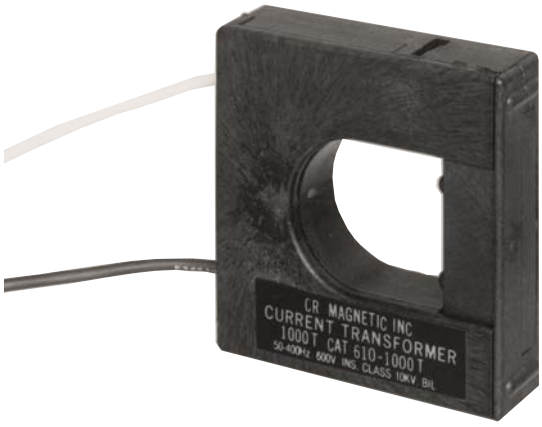
OUTLINE DRAWING





Part Number	A	B	C	D	E	F
CR3109-1500	0.76 (19.2)	0.19 (4.90)	1.24 (31.5)	6.10 (1.55)	0.82 (20.8)	0.20 (5.08)
CR3110-3000	1.00 (25.5)	0.40 (10.2)	1.57 (40.0)	5.91 (150)	1.04 (26.5)	0.24 (6.10)
CR3111-3000	1.24 (31.4)	0.62 (15.7)	1.77 (45.0)	6.10 (155)	1.22 (31.0)	0.20 (5.08)
CR3113-2000	2.68 (68.7)	0.98 (24.9)	2.56 (65.0)	118 (3000)	0.72 (18.4)	0.20 (5.08)

610-1000T



The **610-1000T** Split Core Current Transformer is designed for assembly to an existing electrical installation without the need for dismantling the primary bus or cables. It incorporates a snap fit between the fixed and removable sections.

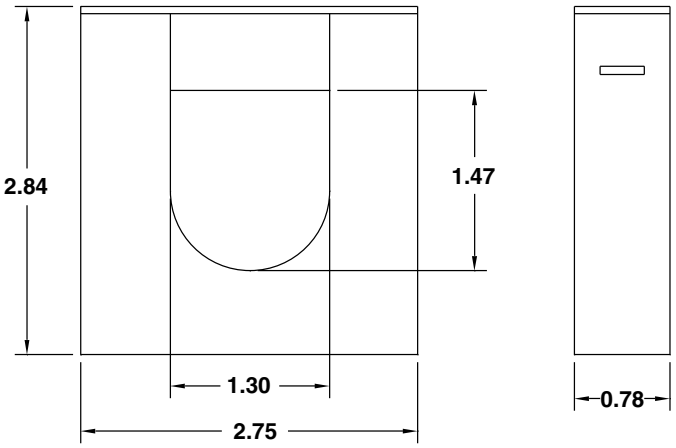
This transformer is intended for use with high input impedance devices that require signal voltages up to 5 VAC.

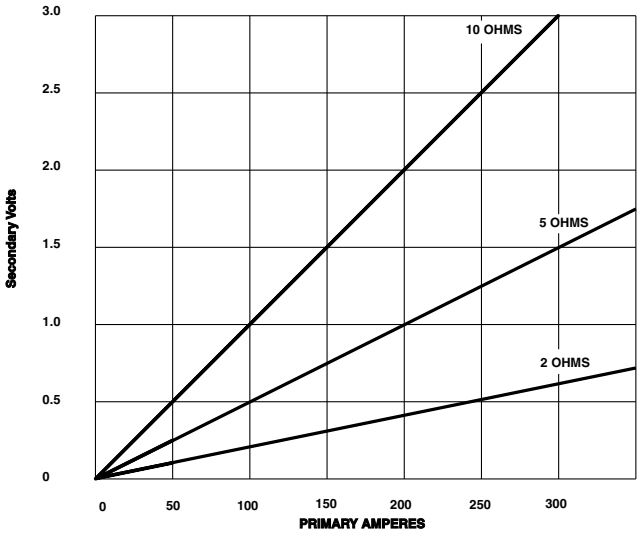
The output can be rectified and filtered for devices requiring DC input. The non-linearity and voltage drop of the rectifiers and filters must be considered in the choice of the loading impedance.

PART NUMBERS

610 - 1000T	1000 Turns

OUTLINE DRAWING





Application
For Energy Management Systems and Instrumentation Equipment having a High Input Impedance, eg. 14K ohms minimum

Frequency
50-400 Hz

Insulation Level
0.6 kV, BIL 10 kV full wave

Construction
The core and windings are encased in UL approved plastic

Continuous Thermal Current Rating Factor 330A at 30° C amb
250A at 55° C amb

Flexible Leads
UL 1015 105° C, CSA approved, #18 AWG, 24" long unless otherwise specified

Approximate Weight
10 oz

Regulatory Agencies

c UL us

613 Series

The **613** Series Split Core Current Transformer is designed for assembly to an existing electrical installation without the need for dismantling the primary bus or cables.

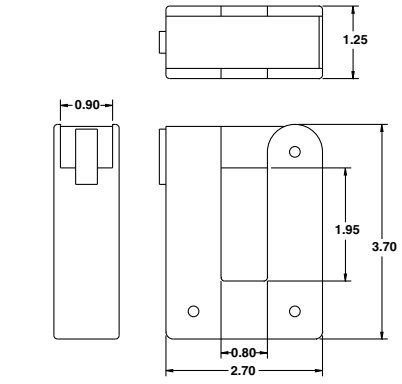
The Model 613-1000T is intended for use with high input impedance devices that require signal voltages up to 5 VAC.

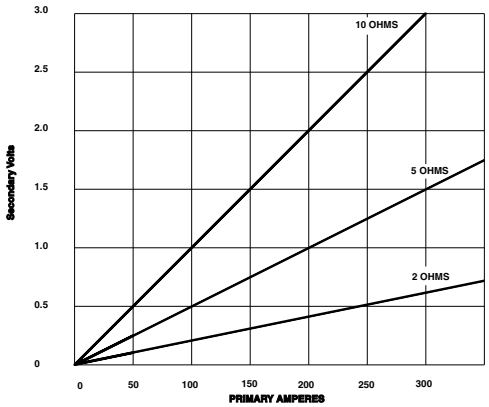
The output can be rectified and filtered for devices requiring DC input. The non-linearity and voltage drop of the rectifiers and filters must be considered in the choice of the loading impedance.

PART NUMBERS

Part Number	Current Ratio	Burden VA	Accuracy at 60 Hz
613-101	100:5	1.00	±5%
613-1250	125:5	1.25	±5%
613-151	150:5	1.50	±5%
613-1750	175:5	1.75	±5%
613-201	200:5	2.50	±4%
613-251	250:5	2.50	±4%
613-301	300:5	3.00	±2%
613-401	400:5	3.00	±2%
613-1000T	100:0.1	See Graph	±3%

OUTLINE DRAWING





Application
For Energy Management Systems and Instrumentation Equipment

Frequency
50-400Hz

Insulation
0.6 kV, BIL 10 kV full wave

Construction
The core and windings are encased in UL approved plastic

Continuous Thermal Current Rating Factor Models 613-101 – 613-401:
1.33 at 30° C amb
1.00 at 55° C amb
Model 613-1000T:
330A at 30° C amb
250A at 55° C amb

Flexible Leads
UL 1015 105° C, CSA approved, #16 AWG, 24" long unless otherwise specified

Approximate Weight
1 lb

Caution
Proper safety precautions must be followed during installation by a trained electrician. Never install while bus is energized. The current transformer must have its secondary terminals short circuited or the burden connected, before energizing the primary circuit.

Regulatory Agencies

603 & 603D Series

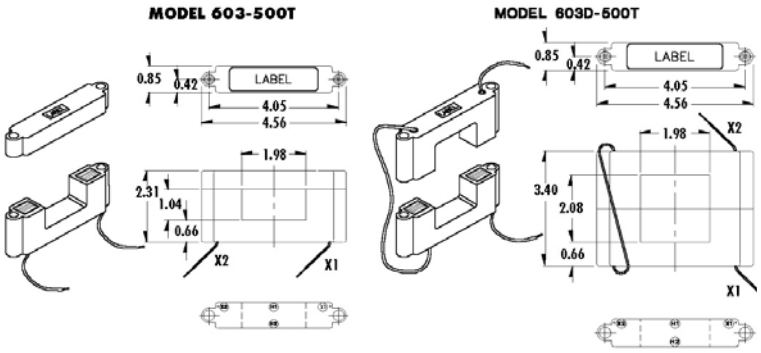
The **603 & 603D** Split Core Current Transformers are designed for assembly to an existing electrical installation without the need for dismantling the primary bus or cables.

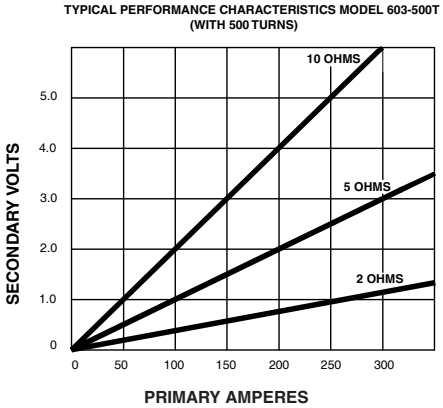
These transformers are intended for use with high input impedance devices that require signal voltages up to 5 VAC.

The output can be rectified and filtered for devices requiring DC input. The non-linearity and voltage drop of the rectifiers and filters must be considered in the choice of the loading impedance.

PART NUMBERS	
603 - 500T	500 Turns
603D - 500T	500 Turns

OUTLINE DRAWING





Application
For Energy Management Systems and Instrumentation Equipment Having a High Input Impedance, eg. 14K ohms minimum

Frequency
50-400Hz

Construction
The core and windings are encased in UL approved plastic

Insulation Level
0.6 kV, BIL 10 kV full wave

Continuous Thermal Current Rating Factor Model 603:
350A at 30° C amb.
260A at 55° C amb.

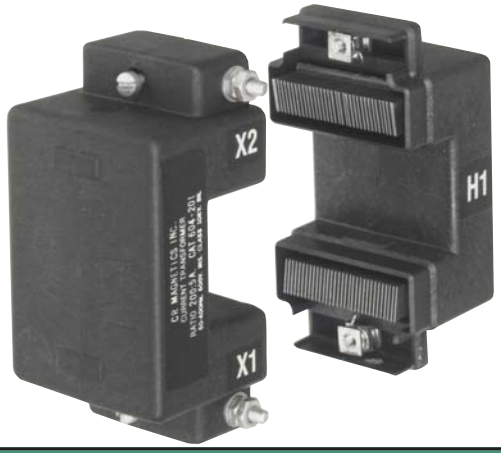
Flexible Leads
UL 1015 105° C, CSA approved, #22 AWG, 24" long unless otherwise specified

Approximate Weight
Model 603-500T: 10 oz.
Model 603D-500T: 12 oz.

Regulatory Agencies

c UL us

604 Series



The **604** Series Split Core Current Transformer is designed for assembly to an existing electrical installation without the need for dismantling the primary bus or cables.

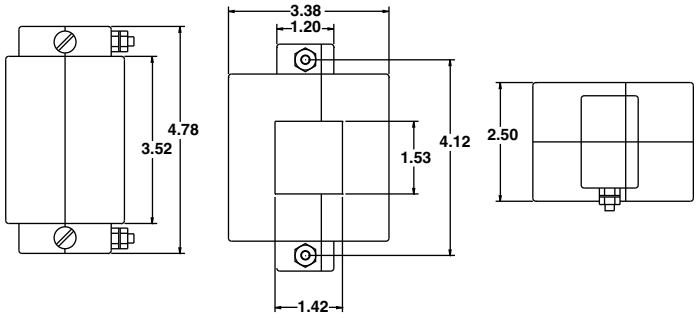
The Model 604-1000T is intended for use with high input impedance devices.

The output can be rectified and filtered for devices requiring DC input. The non-linearity and voltage drop of the rectifiers and filters must be considered in the choice of the loading impedance.

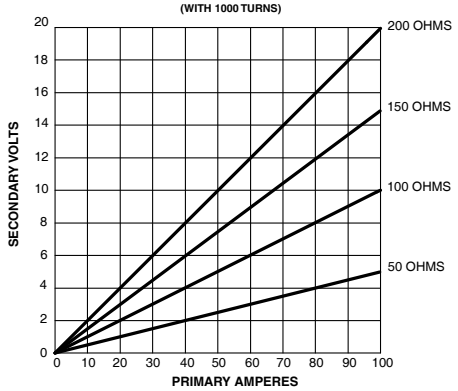
PART NUMBERS

Part Number	Current Ratio	Burden VA	Accuracy at 60 Hz
604-101	100:5	1.00	±5%
604-1250	125:5	1.00	±5%
604-151	150:5	1.00	±4%
604-1750	175:5	1.00	±3%
604-201	200:5	1.00	±2%
604-251	250:5	2.00	±2%
604-301	300:5	2.00	±1.5%
604-351	350:5	2.50	±1.5%
604-401	400:5	2.50	±1.5%
604-1000T	100:0.1	See Graph	±3%

OUTLINE DRAWING



TYPICAL PERFORMANCE CHARACTERISTICS MODEL 604-1000T
(WITH 1000 TURNS)



Application
For Energy Management Systems and Instrumentation

Frequency
50-400Hz

Insulation Level
0.6 kV, BIL 10 kV full wave

Continuous Thermal Current Rating
Factor Models 604-101 – 604-401:
1.33 at 30° C amb
1.00 at 55° C amb
Model 604-1000T:
450A at 30° C amb
350A at 55° C amb

Terminals
10-32 brass studs with one flatwasher and two regular nuts

Flexible Leads
UL 1015 105° C, CSA approved, #16 AWG, 24" long unless otherwise specified

Approximate Weight
2.5 lbs

Regulatory Agencies

c UL us

600 & 601 Series

The **600 & 601** Series Split Core Current Transformers are designed for assembly to an existing electrical installation without the need for dismantling the primary bus or cables.

Application
For Energy Management Systems and Instrumentation

Frequency
50-400Hz

Construction
The core and windings are encased in UL approved plastic

Insulation Level
0.6 kV, BIL 10 kV full wave

Continuous Thermal Current Rating Factor 1.33 at 30° C amb
1.00 at 55° C amb

Terminals
8-32 brass studs with one flatwasher and two regular nuts

Flexible Leads
UL 1015 105° C, CSA approved, #16 AWG, 24" long unless otherwise specified

Approximate Weight
1.5 lbs.

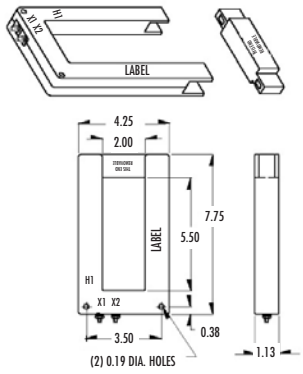
Caution
Proper safety precautions must be followed during installation by a trained electrician. Never install while bus is energized. The current transformer must have its secondary terminals short circuited or the burden connected, before energizing the primary circuit.

Regulatory Agencies

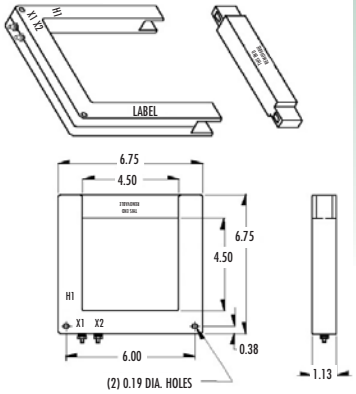
c UL us

OUTLINE DRAWING

MODEL 600



MODEL 601



PART NUMBERS

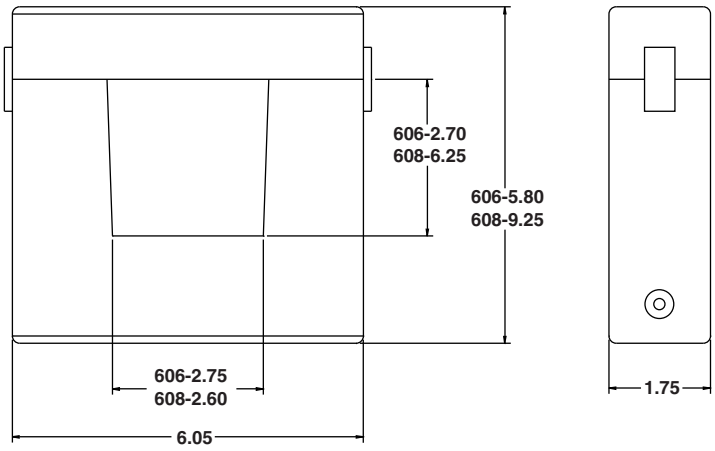
Part Number	Current Ratio	VA at 1% Class	ANSI Metering Class at 60Hz		
			B0.1	B0.2	B0.5
600-401	400:5A	1.5	2.4		--------
600-501	500:5A	2.0	2.4		--------
600-601	600:5A	2.5	2.4	2.4	--------
600-801	800:5A	5.0	1.2	1.2	2.4
600-102	1000:5A	7.5	1.2	1.2	2.4
600-122	1200:5A	15.0	0.6	1.2	1.2
600-152	1500:5A	20.0	0.6	0.6	1.2
600-162	1600:5A	20.0	0.6	0.6	1.2
600-202	2000:5A	30.0	0.6	0.6	0.6

Part Number	Current Ratio	VA at 1% Class	ANSI Metering Class at 60Hz		
			B0.1	B0.2	B0.5
601-401	400:5A	1.0	4.8	--------	--------
601-501	500:5A	1.5	4.8	4.8	--------
601-601	600:5A	2.0	2.4	4.8	--------
601-801	800:5A	2.5	1.2	2.4	4.8
601-102	1000:5A	5.0	1.2	1.2	4.8
601-122	1200:5A	10.0	1.2	1.2	2.4
601-152	1500:5A	15.0	1.2	1.2	1.2
601-162	1600:5A	15.0	1.2	1.2	1.2
601-202	2000:5A	20.0	0.6	0.6	1.2

606 & 608 Series

The **606 & 608** Split Core Current Transformers are designed for assembly to an existing electrical installation without the need for dismantling the primary bus or cables. These current transformers are a weather proof design suitable for use outdoor or in direct burial applications. The transformer cases are UV stabilized thermoplastic and filled with polyurethane resin. The mating surfaces of the transformer cores are protected by a rubber 'O' ring.

OUTLINE DRAWING



Application
For Energy Management Systems and Instrumentation Equipment

Frequency
50-400Hz

Insulation Level
0.6 kV, BIL 10 kV full wave

Continuous Thermal Current Rating Factor
Model 606: 1.33 at 30° C amb., 1.00 at 55° C amb Models 608-501 – 608-202:
1.33 at 30° C amb., 1.00 at 55° C amb Models 608-252 – 608-322:
1.00 at 30° C amb., 0.70 at 55° C amb

Secondary Cable
Two No. 16 AWG, 6' Long, Direct Burial, UV Res. UL Type TC

Weight
Model 606: 4.5 lbs
Model 608: 7.5 lbs

Regulatory Agencies

c UL us

PART NUMBERS

Part Number	Current Ratio	Burden VA	ANSI Metering Class at 60Hz		Part Number	Current Ratio	Burden VA	ANSI Metering Class at 60Hz
606-201	200:5A	2.5	1%		608-501	500:5A	6.0	1%
606-251	250:5A	3.0	1%		608-601	600:5A	8.0	1%
606-301	300:5A	3.5	1%		608-801	800:5A	12.0	1%
606-351	350:5A	4.0	1%		608-102	1000:5A	13.0	1%
606-402	400:5A	5.0	1%		608-122	1200:5A	16.0	1%
606-501	500:5A	6.0	1%		608-152	1500:5A	25.0	1%
606-601	600:5A	8.0	1%		608-162	1600:5A	27.0	1%
606-751	750:5A	10.0	1%		608-202	2000:5A	33.0	1%
606-801	800:5A	12.0	1%		608-252	2000:5A	42.0	1%
606-102	1000:5A	15.0	1%		608-302	3000:5A	50.0	1%
606-122	1200:5A	20.0	1%		608-322	3200:5A	54.0	1%

Model 500 Series

The **500** Series Split Core Current Transformer is designed to be assembled around an existing conductor or bus bar. The end marked "This end removable" may be disassembled and then reassembled around the conductors. Terminals are 8-32 brass studs with one flatwasher, lockwasher and regular nut. Flexible Leads are UL 1015 105° C, CSA approved, #16 AWG, 24" long unless otherwise specified

Application
Metering

Frequency
50-400Hz

Insulation Level
0.6 kV, BIL 10 kV full wave

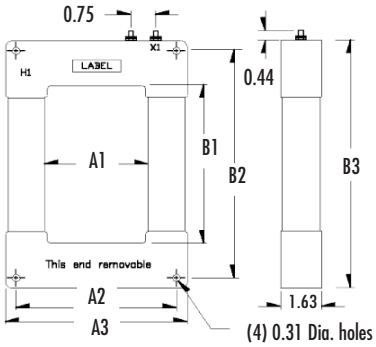
Continuous Thermal Current Rating Factor
1.33 at 30° C amb., 1.00 at 55° C amb

Approximate Weight
8 to 18 lbs

Regulatory Agencies

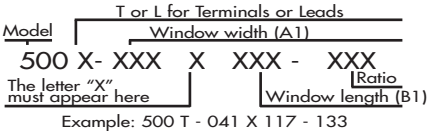
c UL us

OUTLINE DRAWING



DIMENSIONS						MAX RATIO
A1'	A2'	A3'	B1'	B2'	B3'	
4.1	6.4	7.3	7.1	10.0	10.9	4000:5
4.1	6.4	7.3	11.7	14.5	15.4	8000:5
4.1	6.4	7.3	14.1	17.0	17.9	8000:5
4.1	6.4	7.3	18.1	21.0	21.9	8000:5
4.1	6.4	7.3	24.0	27.0	27.9	10000:5
4.1	6.4	7.3	30.1	33.0	33.9	10000:5
5.1	7.2	8.3	7.1	10.0	10.9	4000:5
5.1	7.2	8.3	11.7	14.5	15.4	8000:5
5.1	7.2	8.3	14.1	17.0	17.9	8000:5
5.1	7.2	8.3	18.1	21.0	21.9	8000:5
5.1	7.2	8.3	24.0	27.0	27.9	10000:5
5.1	7.2	8.3	30.1	33.0	33.9	10000:5
5.8	7.0	9.0	7.1	10.0	10.9	4000:5
5.8	7.0	9.0	11.7	14.5	15.4	8000:5
5.8	7.0	9.0	14.1	17.0	17.9	8000:5
5.8	7.0	9.0	18.1	21.0	21.9	8000:5
5.8	7.0	9.0	24.0	27.0	27.9	10000:5
5.8	7.0	9.0	30.1	33.0	33.9	10000:5
8.0	9.5	11.1	7.1	10.0	10.9	4000:5
8.0	9.5	11.1	11.7	14.5	15.4	8000:5
8.0	9.5	11.1	14.1	17.0	17.9	8000:5
8.0	9.5	11.1	18.1	21.0	21.9	8000:5
8.0	9.5	11.1	24.0	27.0	27.9	10000:5
8.0	9.5	11.1	30.1	33.0	33.9	10000:5
10.1	11.6	13.2	7.1	10.0	10.9	4000:5
10.1	11.6	13.2	11.7	14.5	15.4	8000:5
10.1	11.6	13.2	14.1	17.0	17.9	8000:5
10.1	11.6	13.2	18.1	21.0	21.9	8000:5
10.1	11.6	13.2	24.0	27.0	27.9	10000:5
10.1	11.6	13.2	30.1	33.0	33.9	10000:5

How to order take apart C.T.'S



Example: 500 T - 041 X 117 - 133

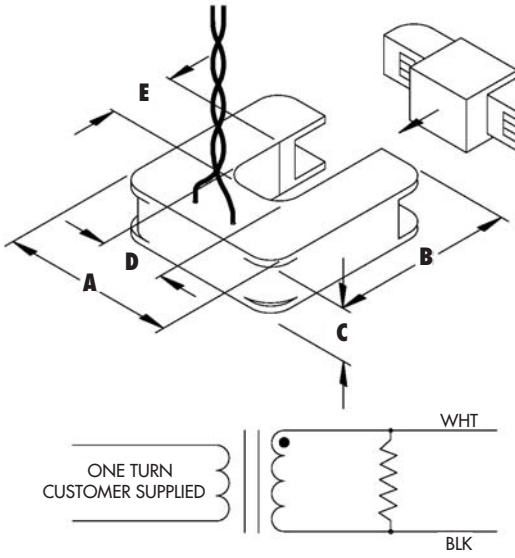
The accuracy table below is for the 500T-041 X 117. Accuracies for other sizes are available from the factory. The dimensions in the table at the left are standard sizes. Other window lengths (B1) may be accommodated on special order. Window widths (A1) other than those listed are not available.

Current Ratio	Accuracy class with U.P.F. burden
300:5	±5% at 1.5 VA
400:5	±3% at 2.5 VA
500:5	±2% at 2.5 VA
600:5	±1% at 4 VA
750:5	±1% at 5 VA
800:5	±1% at 5 VA
1000:5	±1% at 7.5 VA
1200:5	±1% at 10.0 VA
1500:5	±1% at 12.5 VA
2000:5	±1% at 15.0 VA
2500:5	±1% at 25.0 VA
3000:5	±1% at 25.0 VA
3500:5	±1% at 25.0 VA
4000:5	±1% at 25.0 VA
5000:5	±1% at 30.0 VA
5000:5	±1% at 40.0 VA

CR3120, CR3130, CR3140 Series

The **CR3120, CR3130, CR3140** Split Core Current Transformers are designed for assembly to an existing electrical installation without the need for dismantling the primary bus or cables. The **CR3120, CR3130, CR3140 Series** has one of the highest industry standards both for interleaving and the self locking mechanism.

OUTLINE DRAWING



SIZE	CR3120	CR3130	CR3140
A	2.00 (50.8)	3.25 (82.6)	4.75 (120.7)
B	2.10 (53.3)	3.35 (85.1)	5.00 (127)
C	0.61 (15.2)	1.00 (25.4)	1.00 (25.4)
D	0.75 (19.05)	1.25 (31.75)	2.00 (50.8)
E	0.75 (19.05)	1.25 (31.75)	2.00 (50.8)

Application
For Energy Management Systems and Instrumentation Equipment

Frequency
50-400Hz

Insulation Level
0.6 kV, BIL 10 kV full wave

Features:
Output 0.333 VAC at Rated Current
Phase Angle <2 degrees measured at 50% rated current
Linearity Accuracy +/- 1%

Secondary Cable
Two No. 16 AWG, 8' Long,

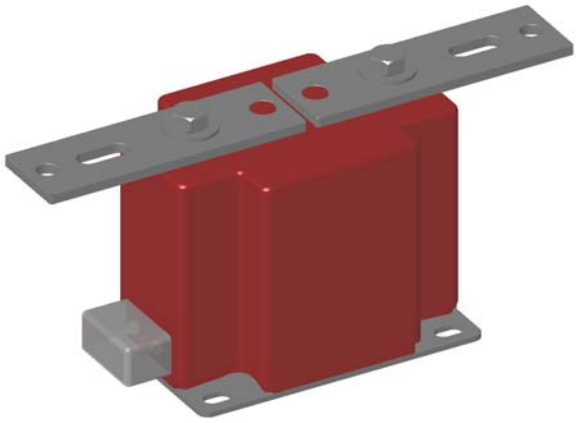
Weight
CR3120: 1.0 lbs
CR3130: 1.0 lbs
CR3140: 1.0 lbs

Regulatory Agencies

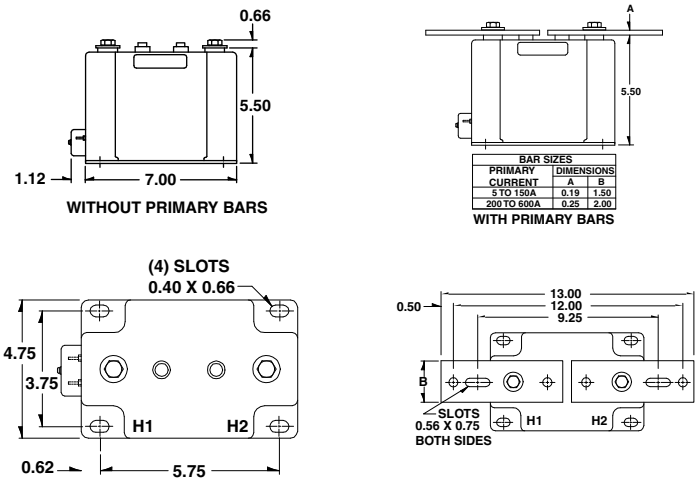
PART NUMBERS

Part Number	Current Ratio	Part Number	Current Ratio	Part Number	Current Ratio
CR3120-5	5:0.333V	CR3130-50	50:0.333V	CR3140-100	100:0.333V
CR3120-10	10:0.333V	CR3130-100	100:0.333V	CR3140-200	200:0.333V
CR3120-25	25:0.333V	CR3130-150	150:0.333V	CR3140-400	400:0.333V
CR3120-50	50:0.333V	CR3130-200	200:0.333V	CR3140-600	600:0.333V
CR3120-70	70:0.333V	CR3130-250	250:0.333V	CR3140-800	800:0.333V
CR3120-100	100:0.333V	CR3130-300	300:0.333V	CR3140-1000	1000:0.333V
CR3120-150	150:0.333V	CR3130-400	400:0.333V	CR3140-1200	1200:0.333V
CR3120-200	200:0.333V	CR3130-600	600:0.333V	CR3140-1500	1500:0.333V

CTW3-60-T50 & CTWH3-60-T50



OUTLINE DRAWING



CAUTION: Use only the Belleville washers supplied. Tighten to between 25 and 30 foot-pounds. Do not overtighten.

Part Number*	Current Ratio	Relay Class	ANSI Metering Class at 60 Hz					**Thermal Current Rating 1 second RMS Amps
			B0.1	B0.2	B0.5	B0.9	B1.8	
CTW3-60-T50-050	5:5	T50	0.3	0.3	0.3	0.6	1.2	375
CTW3-60-T50-100	10:5	T50	0.3	0.3	0.3	0.6	1.2	1000
CTW3-60-T50-150	15:5	T50	0.3	0.3	0.3	0.6	1.2	1690
CTW3-60-T50-200	20:5	T50	0.3	0.3	0.3	0.6	1.2	1900
CTW3-60-T50-250	25:5	T50	0.3	0.3	0.3	0.6	1.2	2700
CTW3-60-T50-300	30:5	T50	0.3	0.3	0.3	0.6	1.2	2700
CTW3-60-T50-400	40:5	T50	0.3	0.3	0.3	0.6	1.2	4720
CTW3-60-T50-500	50:5	T50	0.3	0.3	0.3	0.6	1.2	4720
CTW3-60-T50-750	75:5	T50	0.3	0.3	0.3	0.6	1.2	8630
CTW3-60-T50-101	100:5	T50	0.3	0.3	0.3	0.6	1.2	8630
CTW3-60-T50-151	150:5	T50	0.3	0.3	0.3	0.6	1.2	14380
CTW3-60-T50-201	200:5	T50	0.3	0.3	0.3	0.6	1.2	17250
CTW3-60-T50-251	250:5	T50	0.3	0.3	0.3	0.6	1.2	17250
CTW3-60-T50-301	300:5	T50	0.3	0.3	0.3	0.6	1.2	37800
CTW3-60-T50-401	400:5	T50	0.3	0.3	0.3	0.6	1.2	37800
CTW3-60-T50-501	500:5	T50	0.3	0.3	0.3	0.6	1.2	37800
CTW3-60-T50-601	600:5	T50	0.3	0.3	0.3	0.6	1.2	37800

* For ordering with primary bars, change model number to CTWH3.
** With a burden of B 0.1 or greater connected to the secondary.

Applications
Metering and relaying.

Frequency
50 - 400 Hz.

Maximum System Voltage
5.6kV, BIL 60kV full wave.

Continuous Thermal Current Rating Factor
1.50 at 30° C amb., 1.33 at 55° C amb.
150:5 and 600:5
1.33 at 30° C amb., 1.00 at 55° C amb. 250:5
1.00 at 30° C amb., 0.85 at 55° C amb.

Primary Terminals
1/2-13 bolts with one Belleville washer.

Secondary Terminals
Brass studs No. 10-32 with one flatwasher, lockwasher and regular nut.

Supplied with short circuiting secondary terminal cover

Vacuum cast in polyurethane resin.

Other ratios, secondary currents and dual ratios are available. Refer to factory.

The transformers are tested for partial discharge to Canadian Standards CAN3-C13-M83. This test can also be carried out to IEC requirements if requested.

Approximate weight
20 lbs.

Regulatory Agencies

c UL us

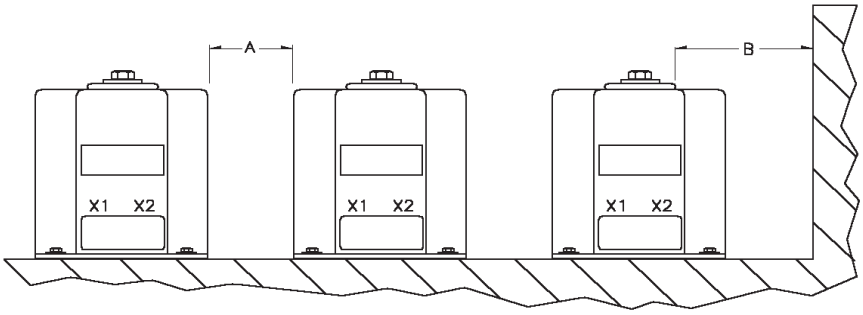
BAR SIZES		
PRIMARY CURRENT	DIMENSIONS	
	A	B
5 TO 250A	0.19	1.50
300 TO 1200A	0.25	2.00

CTW3-60-T50

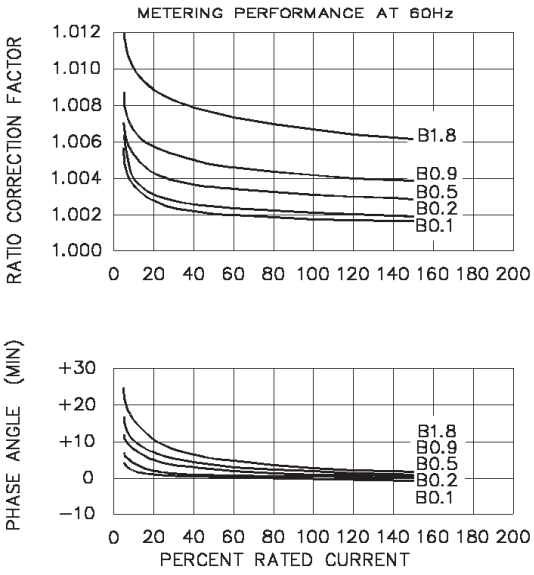
RECOMMENDED MINIMUM SPACINGS

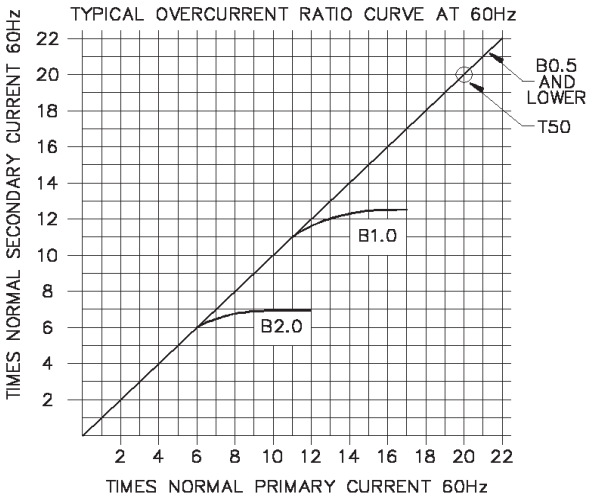
A; Unit to Unit
= 0.75" minimum.

B; HV to Ground in Air
= 3.00" minimum.

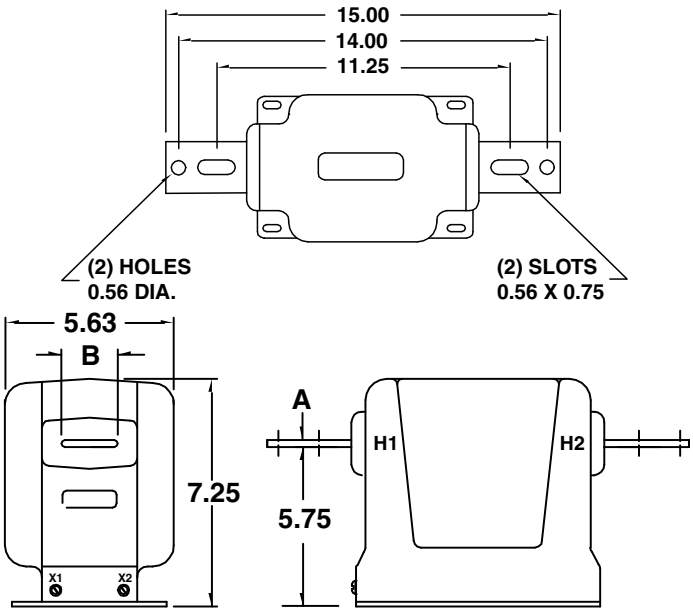


Recommended spacings are for guidance only. User needs to set appropriate values to assure performance for high potential test, impulse test, high humidity, partial discharge, high altitude, and other considerations like configuration.





CTWH3-60-T100



Part Number*	Current Ratio	Relay Class	ANSI Metering Class at 60 Hz					**Thermal Current Rating 1 second RMS Amps
			B0.1	B0.2	B0.5	B0.9	B1.8	
CTWH3-60-T100-050	5:5	T100	0.3	0.3	0.3	0.3	0.3	470
CTWH3-60-T100-100	* 10:5	T100	0.3	0.3	0.3	0.3	0.3	900
CTWH3-60-T100-150	* 15:5	T100	0.3	0.3	0.3	0.3	0.3	1600
CTWH3-60-T100-200	* 20:5	T100	0.3	0.3	0.3	0.3	0.3	1900
CTWH3-60-T100-250	* 25:5	T100	0.3	0.3	0.3	0.3	0.3	2600
CTWH3-60-T100-300	* 30:5	T100	0.3	0.3	0.3	0.3	0.3	2900
CTWH3-60-T100-400	* 40:5	T100	0.3	0.3	0.3	0.3	0.3	3800
CTWH3-60-T100-500	* 50:5	T100	0.3	0.3	0.3	0.3	0.3	4700
CTWH3-60-T100-750	* 75:5	T100	0.3	0.3	0.3	0.3	0.3	5900
CTWH3-60-T100-101	* 100:5	T100	0.3	0.3	0.3	0.3	0.3	8600
CTWH3-60-T100-151	* 150:5	T100	0.3	0.3	0.3	0.3	0.3	12900
CTWH3-60-T100-201	* 200:5	T100	0.3	0.3	0.3	0.3	0.3	17200
CTWH3-60-T100-251	* 250:5	T100	0.3	0.3	0.3	0.3	0.3	17200
CTWH3-60-T100-301	* 300:5	T100	0.3	0.3	0.3	0.3	0.3	34500
CTWH3-60-T100-401	* 400:5	T100	0.3	0.3	0.3	0.3	0.3	34500
CTWH3-60-T100-601	* 600:5	T100	0.3	0.3	0.3	0.3	0.3	66200
CTWH3-60-T100-801	* 800:5	T100	0.3	0.3	0.3	0.3	0.3	66200
CTWH3-60-T100-102	* 1000:5	T100	0.3	0.3	0.3	0.3	0.3	66200
CTWH3-60-T100-122	* 1200:5	T100	0.3	0.3	0.3	0.3	0.3	66200

** With a burden of B 0.1 or greater connected to the secondary.

Applications
Metering and relaying.

Frequency
50 - 400 Hz.

Maximum System Voltage
5.6kV, BIL 60kV full wave.

Continuous Thermal Current Rating Factor
1.50 at 30° C amb., 1.33 at 55° C amb.
250:5, 1000:5 & 1200:5-
1.10 at 30° C amb., 0.85 at 55° C amb.

Primary Terminals
Plated copper bars. See chart for sizes.

Secondary Terminals
Brass screws No. 10-32 with one flatwasher and one lockwasher.

Vacuum cast in polyurethane resin.

Other ratios, secondary currents and dual ratios are available. Refer to factory.

The transformers are tested for partial discharge to Canadian Standards CAN3-C13-M83. This test can also be carried out to IEC requirements if requested.

Approximate weight
41 lbs.

Regulatory Agencies

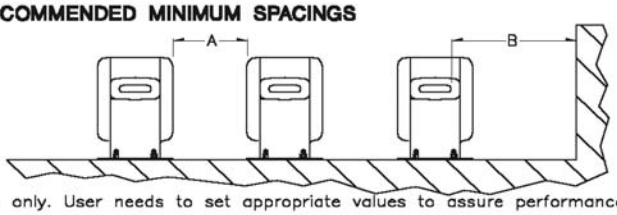
BAR SIZES		
PRIMARY CURRENT	DIMENSIONS	
	A	B
5 TO 250A	0.25	1.50
300 TO 1200A	0.38	2.00

CTWH3-60-T100

RECOMMENDED MINIMUM SPACINGS

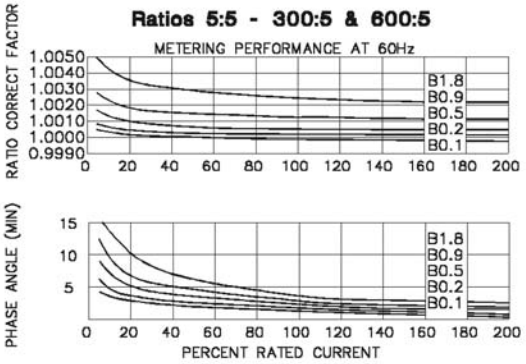
A; Unit to Unit
= 0.75" minimum.

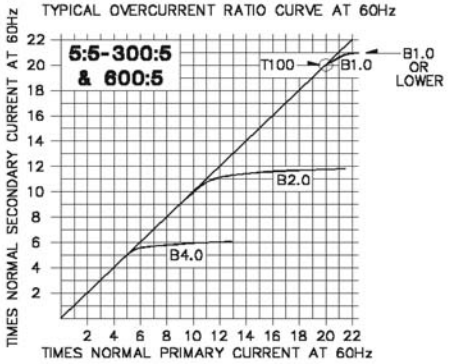
B; HV to Ground in Air
= 3.00" minimum.



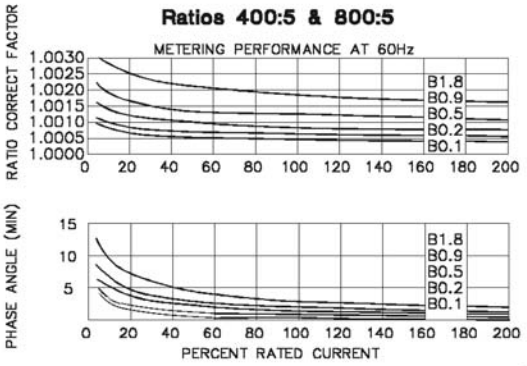
Recommended spacings are for guidance only. User needs to set appropriate values to assure performance for high potential test, impulse test, high humidity, partial discharge, high altitude, and other considerations like configuration.

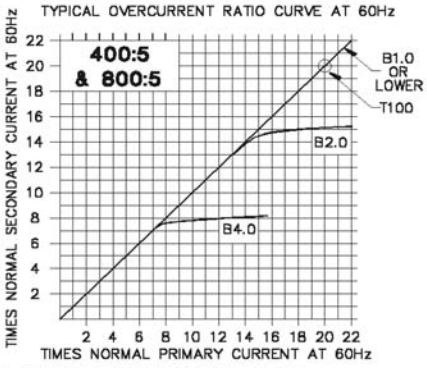
Ratios 5:5 - 300:5 & 600:5



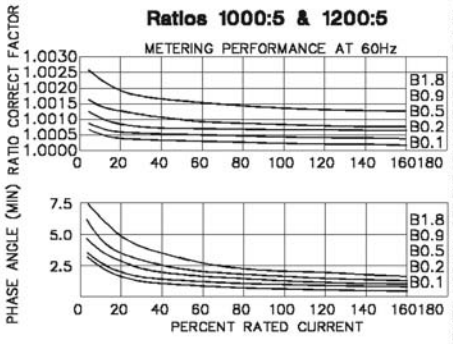


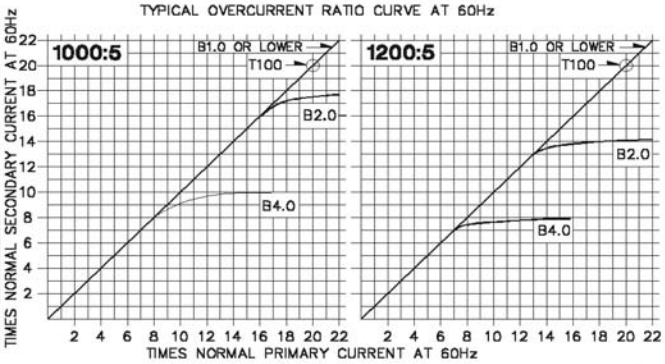
Ratios 400:5 & 800:5



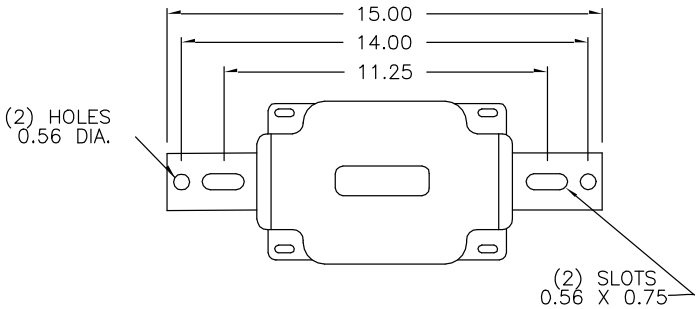


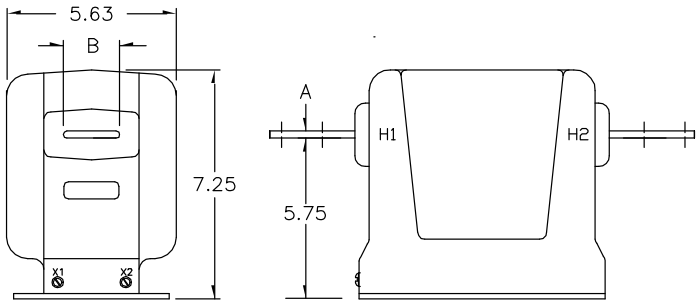
Ratios 1000:5 & 1200:5





CTWH3-A-60-T90





Catalog Number*	Current Ratio	Relay Class	ANSI Metering Class at 60 Hz					*Thermal Current Rating 1 second RMS Amps
			B0.1	B0.2	B0.5	B0.9	B1.8	
CTWH3-A-60-T90-050	5:5	T90	0.1	0.1	0.1	0.1	0.2	470
CTWH3-A-60-T90-100	10:5	T90	0.1	0.1	0.1	0.1	0.2	900
CTWH3-A-60-T90-150	15:5	T90	0.1	0.1	0.1	0.1	0.2	1700
CTWH3-A-60-T90-200	20:5	T90	0.1	0.1	0.1	0.1	0.2	1920
CTWH3-A-60-T90-250	25:5	T90	0.1	0.1	0.1	0.1	0.2	2600
CTWH3-A-60-T90-300	30:5	T90	0.1	0.1	0.1	0.1	0.2	2900
CTWH3-A-60-T90-400	40:5	T90	0.1	0.1	0.1	0.1	0.2	3700
CTWH3-A-60-T90-500	50:5	T90	0.1	0.1	0.1	0.1	0.2	4700
CTWH3-A-60-T90-750	75:5	T90	0.1	0.1	0.1	0.1	0.2	5800
CTWH3-A-60-T90-101	100:5	T90	0.1	0.1	0.1	0.1	0.2	8600
CTWH3-A-60-T90-151	150:5	T90	0.1	0.1	0.1	0.1	0.2	12900
CTWH3-A-60-T90-201	200:5	T90	0.1	0.1	0.1	0.1	0.2	18000
CTWH3-A-60-T90-301	300:5	T90	0.1	0.1	0.1	0.1	0.2	28200
CTWH3-A-60-T90-401	400:5	T90	0.1	0.1	0.1	0.1	0.2	34000
CTWH3-A-60-T90-601	600:5	T90	0.1	0.1	0.1	0.1	0.2	51500

* With a burden of B 0.1 or greater connected to the secondary.

Applications
High accuracy metering and relaying.

Frequency
50 - 400 Hz.

Maximum System Voltage
5.6kV, BIL 60kV full wave.

Continuous Thermal Current Rating Factor
1.33 at 30° C amb., 1.0 at 55° C amb.
400:5
1.1 at 30° C amb., 0.85 at 55° C amb.

Primary Terminals
Plated copper bars. See chart for sizes.

Secondary Terminals
Brass screws No. 10-32 with one flatwasher & lockwasher.

Vacuum cast in polyurethane resin.

Other ratios, secondary currents and dual ratios are available. Refer to factory.

The transformers are tested for partial discharge to Canadian Standards CAN3-C13-M83. This test can also be carried out to IEC requirements if requested.

Approximate weight
41 lbs.

Regulatory Agencies

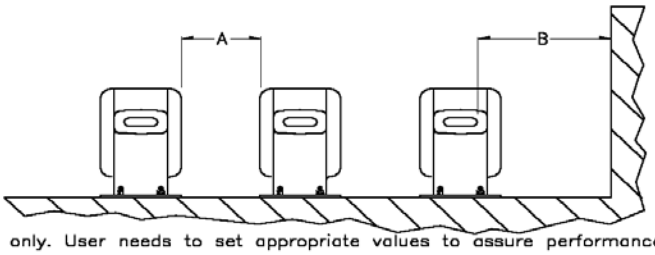
BAR SIZES		
PRIMARY CURRENT	DIMENSIONS	
	A	B
5 TO 250A	0.25	1.50
300 TO 1200A	0.38	2.00

CTWH3-A-60-T90

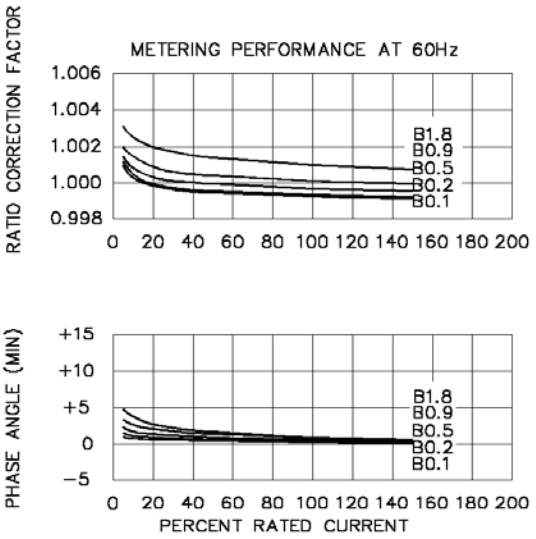
RECOMMENDED MINIMUM SPACINGS

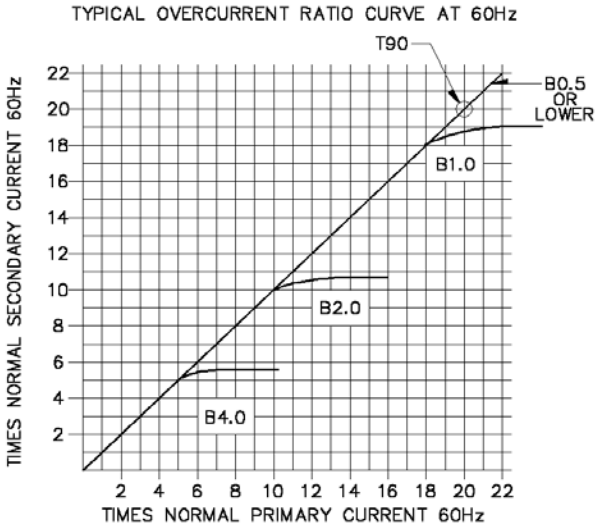
A; Unit to Unit
= 0.75" minimum.

B; HV to Ground in Air
= 3.00" minimum.

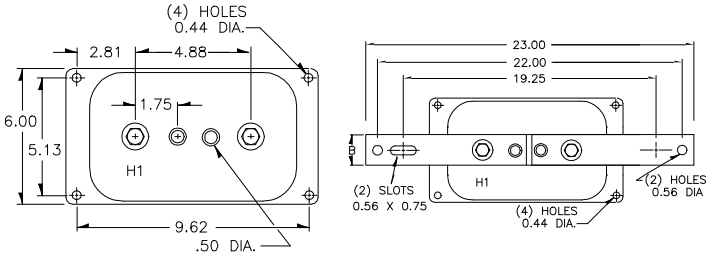


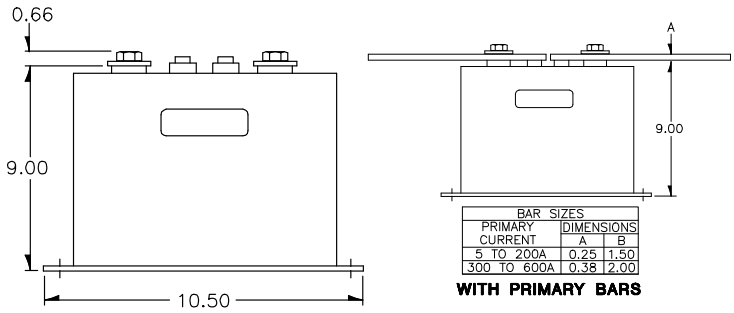
Recommended spacings are for guidance only. User needs to set appropriate values to assure performance for high potential test, impulse test, high humidity, partial discharge, high altitude, and other considerations like configuration.





CTW5-L-110 & CTWH5-L-110





CAUTION: Use only the Belleville washers supplied. Tighten to between 25 and 30 foot-pounds. Do not overtighten.

Part Number*	Current Ratio	Relay Class	ANSI Metering Class at 60 Hz					Thermal Current Rating 1 second RMS Amps
			B0.1	B0.2	B0.5	B0.9	B1.8	
CTW5-L-110-T20-050	5:5	T20	0.3	0.3	0.6	1.2	2.4	375
CTW5-L-110-T20-100	10:5	T20	0.3	0.3	0.6	1.2	2.4	590
CTW5-L-110-T20-150	15:5	T20	0.3	0.3	0.6	1.2	2.4	1200
CTW5-L-110-T20-250	25:5	T20	0.3	0.3	0.6	1.2	2.4	1700
CTW5-L-110-T20-300	30:5	T20	0.3	0.3	0.6	1.2	2.4	1700
CTW5-L-110-T20-400	40:5	T20	0.3	0.3	0.6	1.2	2.4	2400
CTW5-L-110-T20-500	50:5	T20	0.3	0.3	0.6	1.2	2.4	4715
CTW5-L-110-T25-750	75:5	T25	0.3	0.3	0.6	1.2	2.4	4715
CTW5-L-110-T25-101	100:5	T25	0.3	0.3	0.6	1.2	2.4	8625
CTW5-L-110-T25-151	150:5	T25	0.3	0.3	0.6	1.2	2.4	11500
CTW5-L-110-T30-201	200:5	T30	0.3	0.3	0.6	1.2	2.4	11500
CTW5-L-110-T20-251	250:5	T20	0.3	0.3	0.6	1.2	2.4	21700
CTW5-L-110-T25-301	300:5	T25	0.3	0.3	0.6	1.2	2.4	21700
CTW5-L-110-T30-401	400:5	T30	0.3	0.3	0.6	1.2	2.4	44700
CTW5-L-110-T35-501	500:5	T35	0.3	0.3	0.3	0.6	1.2	44700
CTW5-L-110-T40-601	600:5	T40	0.3	0.3	0.3	0.6	1.2	44700

* For ordering with primary bars, change model number to CTWH5-L. A test card is provided with each unit.

Applications
Metering and relaying.

Frequency
50 - 400 Hz.

Maximum System Voltage
15.5kV, BIL 110kV full wave.

Continuous Thermal Current Rating Factor
1.00 at 30° C amb., 0.85 at 55° C amb.

Primary Terminals
1/2-13 bolts with one Belleville washer.

Secondary Terminals
Brass screws No. 10-32 with one flatwasher & lockwasher.

Vacuum cast in polyurethane resin.

Other ratios, secondary currents and dual ratios are available. Refer to factory.

The transformers are tested for partial discharge to Canadian Standards CAN3-C13-M83. This test can also be carried out to IEC requirements if requested.

Approximate weight
34 lbs.

Regulatory Agencies

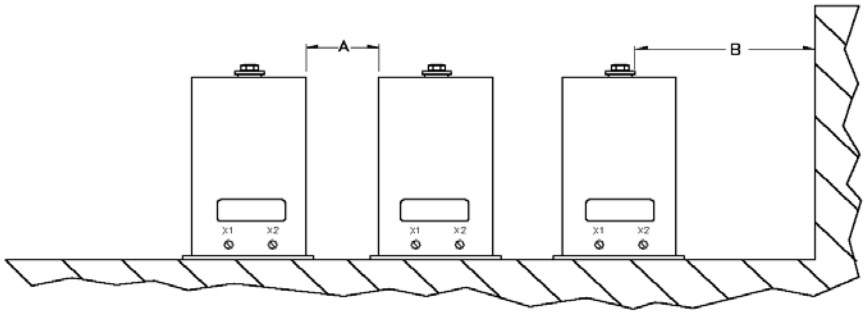
BAR SIZES		
PRIMARY CURRENT	DIMENSIONS	
	A	B
5 TO 250A	0.25	1.50
300 TO 1200A	0.38	2.00

CTWH5 -L-110

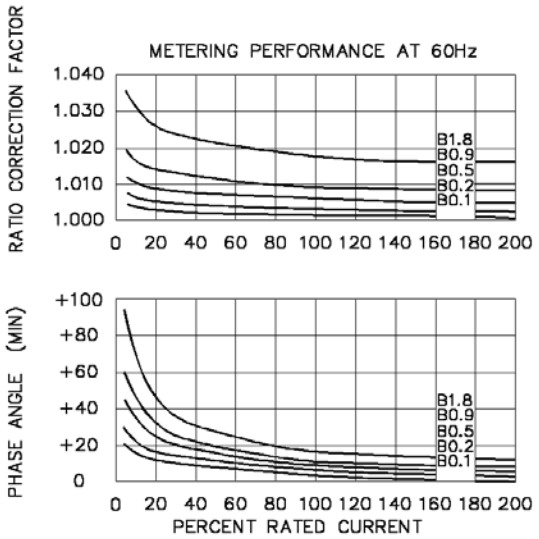
RECOMMENDED MINIMUM SPACINGS

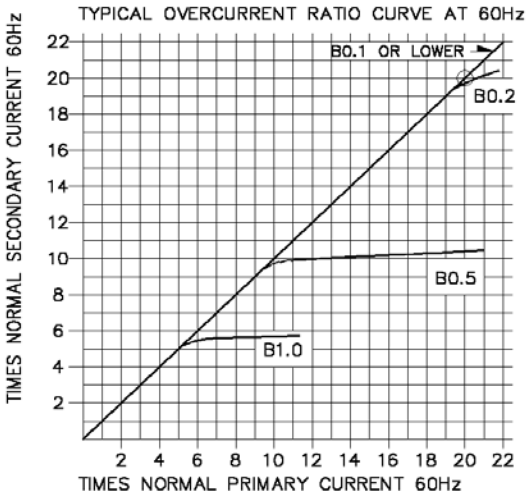
A; Unit to Unit
= 2.00" minimum.

B; HV to Ground in Air
= 6.50" minimum.



Recommended spacings are for guidance only. User needs to set appropriate values to assure performance for high potential test, impulse test, high humidity, partial discharge, high altitude, and other considerations like configuration.





Models 10WP & 189

The Model 10WP is a low ratio wound primary current transformer, suitable for primary currents up to 40 amperes. The Model 10WP table lists the most common current ratings. Primary terminals for the Model 10WP are: for ratios of 25:5 and below, No. 8-32 brass studs with one flatwasher, lockwasher and regular nut, for ratios of 30:5 and above, 1/4-20 brass studs with one flatwasher, lockwasher and regular nut.

Model 10WP

The Model 189 is a low ratio wound primary current transformer suitable for primary currents up to 100 amperes. The Model 189 table lists the most common current ratings. Primary terminals for the Model 189: for ratios of 30:5 and below are, No. 10-32 brass screws with one lockwasher (Dimension A=3.28), for ratios of 40:5 and above, 3/8-16 brass studs with one lockwasher and regular nut (Dimension A=4.10).

Model 189

Continuous Thermal Current Rating Factor

1.33 at 30° C amb., 1.0 at 55° C amb.

Frequency• 50 - 400 Hz.

Insulation Level

0.6 kV, BIL 10kV full wave.

Secondary Terminals

Brass studs No. 8-32 UNC with one flatwasher, lockwasher and regular nut.

Approximate weight

Model 10WP: 1.5 lbs.

Model 189: 0.75 lbs.

Regulatory Agencies

cULus

Model 10WP

Part Number	Current Ratio	ANSI Metering Class at 60 Hz	
		B0.1	B0.2
10WP-0025	2.5:5	0.6	0.6
10WP-005	5:5	0.6	0.6
10WP-0075	7.5:5	0.6	0.6
10WP-010	10:5	0.6	0.6
10WP-015	15:5	0.6	0.6
10WP-020	20:5	0.6	0.6
10WP-025	25:5	0.6	0.6
10WP-030	30:5	0.6	0.6
10WP-040	40:5	0.6	0.6

Model 189

Part Number	Current Ratio	ANSI Metering Class at 60 Hz	
		B0.1	B0.2
189-0025	2.5:5	0.6	0.6
189-005	5:5	0.6	0.6
189-0075	7.5:5	0.6	0.6
189-010	10:5	0.6	0.6
189-015	15:5	0.6	0.6
189-020	20:5	0.6	0.6
189-025	25:5	0.6	0.6
189-030	30:5	0.6	0.6
189-040	40:5	0.6	0.6
189-050	50:5	0.6	0.6
189-060	60:5	0.6	0.6
189-075	75:5	0.6	0.6
189-080	80:5	0.6	0.6
189-101	100:5	0.6	0.6

Potential Transformers

CR Magnetics carries an extensive line of Potential Transformers that are used to monitor and measure various levels of AC voltages. Typically modeled similarly to common power transformers, potential transformers are specially designed to provide accurate input versus output curves over a wide range of loading. Whereas power transformers are typically designed for 70 to 80 percent regulation, potential transformers are designed for 99% or better regulation.

The 467, 468, and 460 Series of voltage transformers are designed to give accurate measurement of low voltage systems (up to 600 VAC) by stepping down higher voltages to 120 VAC. Useful for monitoring and measuring incoming building or factory voltages.

The 3PT-1-45 and PT3-2-45 Series of potential transformers are designed to give accurate measurement of medium voltage systems up to 5KV by stepping down higher voltages to 120 VAC. Useful for monitoring and measuring larger power systems and distribution networks containing medium voltage loads.

The PTW3-1-60 Series of potential transformers are designed to give accurate measurement of medium voltage systems up to 5KV by stepping down higher voltages to 120 VAC. Useful for monitoring and measuring larger power systems and distribution networks containing medium voltage loads. These devices have increased capability to drive larger VA loads.

Contact **CR Magnetics** for other styles of potential transformers including medium voltage units up to 32K VAC, as well as custom designs tailored to fit the specific accuracy and energy capability required by any application.

Voltage Transformer Groups

Group 1. Transformers for application with 100% of rated primary voltage connected to the primary terminals either line-to-line or line-to-ground. These transformers are capable of operating at 125% of rated volts in emergency conditions, but cannot exceed 65% of their thermal burden rating, with a limit of 75°C. temperature rise. This will result in a reduced life expectancy. Consult the factory for details. continuous operation at 110% of rated voltage is permissible, provided that the thermal burden rated volt - amperage is not exceeded.

Rated Primary Voltage for Rated System Voltage Line-to-Line	Turns Ratio	Basic Impulse Insulation Level (kV Crest)
840 1455Y*	7:1	10
840 1455Y*	10:1	10
840 1455Y*	20:1	10
840 1455Y*	35:1	10
840 1455Y*	40:1	10

Rated Primary Voltage for Rated System Voltage Line-to-Line	Turns Ratio	Basic Impulse Insulation Level (kV Crest)
7200 for 12470Y	1:1	10
8400 for 14560Y	1:1	10
12000 for 20785Y	1:1	10
14400 for 24940Y	1:1	10

Group 2. Transformers are for line-to-line connection, but may be connected line-to-neutral at a voltage of the rated line volts divided by the square root of three. continuous operation at 110% of rated voltage is permissible, provided that the thermal burden rated volt-amperes is not exceeded.

Rated Primary Voltage for Rated System Voltage Line-to-Line	Turns Ratio	Basic Impulse Insulation Level (kV Crest)
2400 for 2400Y	20:1	45
3300 for 3300Y*	30:1	60 or 45
4200 for 4200Y*	35:1	60 or 45
4800 for 4800Y	40:1	60 or 45
7200 for 7200Y	60:1	75 or 110
8400 for 8400Y*	70:1	75 or 110
11000 for 11000Y	100:1	95 or 110

Rated Primary Voltage for Rated System Voltage Line-to-Line	Turns Ratio	Basic Impulse Insulation Level (kV Crest)
12000 for 12000Y	100:1	95 or 110
13200 for 13200Y	110:1	95 or 110
14400 for 14400Y	120:1	95 or 110
18000 for 18000Y*	150:1	125*
21000 for 21000Y*	175:1	125*
24000 for 24000Y	200:1	125 or 150
27600 for 27600Y*	240:1	150 or 200
34500 for 34500Y	300:1	150 or 200

Group 4. Transformers are for line-to-ground connection, indoors only. The neutral terminal is insulated to withstand a test voltage of 10kV. They may be continuously operated at 110% of rated voltage, provided that the thermal burden rated volt-amperes is not exceeded. Group 4A transformers are capable of operating at 125% of rated volts in emergency conditions, but cannot exceed 65% of their thermal burden rating, with a limit of 75°C. temperature rise. This will result in a reduced life expectancy. Consult the factory for details.

Group 4A for Operation at 100% Rated Voltage		
Rated Primary Voltage for Rated System Voltage Line-to-Line	Turns Ratio	Basic Impulse Insulation Level (kV Crest)
2400 for 4160 GND Y	20:1	65 or 45*
4200 for 7200 GND Y	35:1	75
4800 for 8320 GND Y	40:1	75
7200 for 12470 Y	60:1	110
8400 for 14560 GND Y	70:1	110

* Not recognized in ANSI/IEEE C57.13

Group 4B for Operation at 58% Rated Voltage		
Rated Primary Voltage for Rated System Voltage Line-to-Line	Turns Ratio	Basic Impulse Insulation Level (kV Crest)
4200 for 4160 GND Y	35:1	65 or 45
4800 for 4800 GND Y	40:1	65 or 45
7200 for 7200 GND Y	60:1	75
8400 for 8400 GND Y	70:1	75
11000 for 11000 GND Y	100:1	110
12000 for 12000 GND Y	100:1	110
13200 for 13200 GND Y	110:1	110
14400 for 14400 GND Y	120:1	110

NOTE: Voltage Transformers connected line-to-ground on an ungrounded system cannot be considered to be grounding transformers and must be operated with the secondaries in closed delta because excessive currents may flow in the delta. For further details see ANSI/IEEE C57.13

1. Delta Connected Supply Systems

When applying voltage transformers to ungrounded delta connected supply systems, the transformer must not be connected in wye with the wye-point connected to neutral ground, or ungrounded. The advent of zero sequence currents caused by a ground fault in the system will cause damage, and eventual destruction of the transformer if the fault is not quickly removed.

2. Ferro resonance

Most voltage transformers are lightly loaded, particularly when associated with watthour metering and relaying schemes. If the voltage transformer has one primary lead grounded, and during an abnormal condition creating a large overvoltage, the transformer may saturate, and its impedance may cause a resonance with the system capacitance. This resonance, or oscillation, may be sustained and could destroy the voltage transformer. If, however, the secondaries are connected in delta, with a broken arrow, and a suitable resistor is connected across the broken corner, then ferro resonance can be damped. Our recommendation for the resistive value is shown on the catalog sheet where it applies. The power rating is determined by the user.

3. Secondary Circuit Check

Immediately prior to connecting the burden and leads to the transformer, a check of the impedance at that circuit should be made. This will avoid a possible short-circuit connection to the transformer, if a short-circuit is applied to the transformer, it can be withstood for one second. Note: Only secondary circuit fuses can adequately protect the transformer from such a short circuit.

4. Primary Fuse Rating

Values shown are suggested for normal installations, in order to protect the system from a voltage transformer failure. Higher ratings at users option, may be used to avoid unusual clearing due to conditions resulting from magnetizing in-rush.

ROUTINE FACTORY TESTS

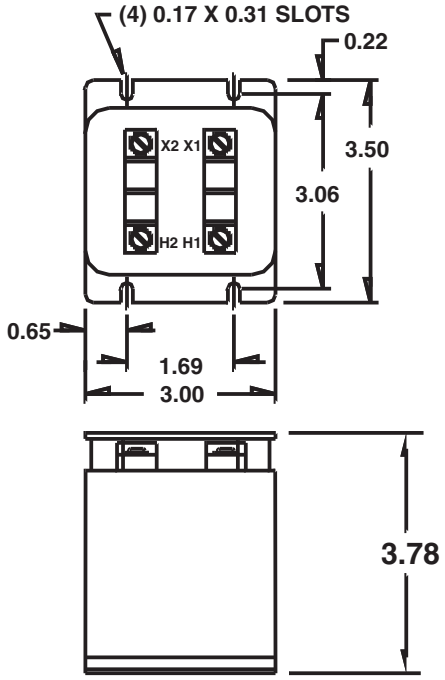
VOLTAGE CLASS	NO. OF BUSHINGS	CONNECTION	LV 1 MIN 60Hz	H2 1 MIN 60Hz	HV 1 MIN 60Hz	INDUCED 18 SEC. 400Hz
5kV	1	L - GND N	2.5kV	10 kV	NA	15kV OR 19kV
	2	L - L	2.5kV	NA	15kV OR 19kV	DOUBLE VOLTAGE
8.7kV	1	L - GND N	2.5kV	10 kV	NA	26kV
	2	L - L	2.5kV	NA	26kV	DOUBLE VOLTAGE
15kV	1	L - GND N	2.5kV	10 kV	NA	34 kV
	2	L - L	2.5kV	NA	34kV OR 36kV	DOUBLE VOLTAGE
25kV	1	L - GND N	2.5kV	10 kV	NA	kV
	2	L - L	2.5kV	NA	kV	DOUBLE VOLTAGE
34.5kV	1	L - GND N	2.5kV	10 kV	NA	70 kV
	2	L - L	2.5kV	NA	70kV OR 80kV	DOUBLE VOLTAGE

Routine Factory Tests include: Polarity, accuracy, and partial discharge per CANADIAN STANDARDS (CAN3-C13-M83) (Partial discharge can also be carried out to IEC requirements on request)

ANSI BURDEN DATA

CONNECTION	VA	POWER FACTOR	ANGLE
W	12.5	0.10	84.3°
X	25	0.70	45.6°
M	35	0.20	78.5°
Y	75	0.85	31.8°
Z	200	0.85	31.8°
ZZ	400	0.85	31.8°

467



The 467 Series of voltage transformers are designed to give accurate measurement of low voltage systems (up to 600 VAC) by stepping down higher voltages to 120 VAC. Useful for monitoring and measuring incoming building or factory voltages.

Frequency
60 Hz.
*Models designed specifically for 50 hz operations are available with reduced performance. Contact factory for details

Standard Secondary Voltage:
120 Volts
Use with CR Magnetics Transducers

Insulation Level:
600 Volt, 10 kV BIL full wave

Accuracy Class:
+/- 1% at all burdens up to 5 vA at 1.0 and 0.95 P.F.

Thermal Rating:
40 VA at 30° C . amb., 27 VA at 55°C. amb
Terminals are No. 6-32 screws with one lockwasher and one flatwasher.
Approximate weight 2.5 lbs.

Regulatory Agencies:

E93779

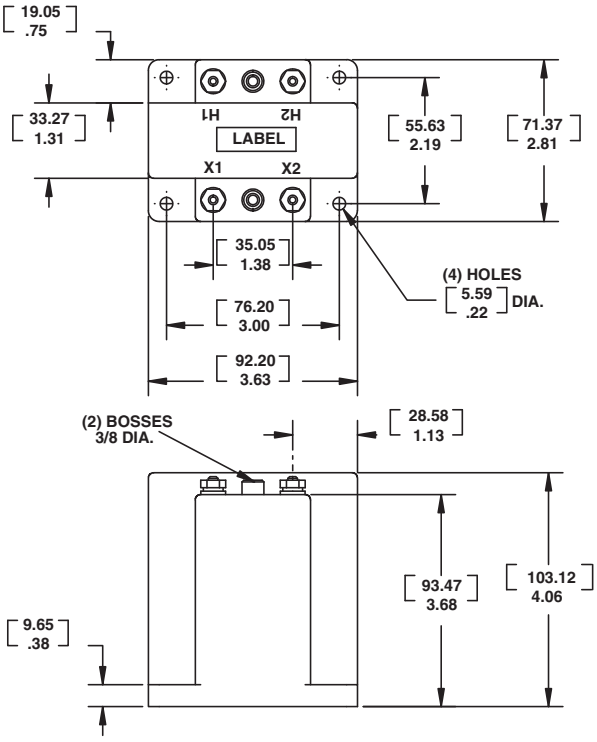
LR89403

Manufactured to meet the requirements of ANSI/IEEE C57.13

PART NUMBERS

Part Number	Voltage Rating	Turns Ratio	Rec. Primary Fuse Rating
467-069	69.3:120	0.58:1	1.5
467-120	120:120	1:1	1.0
467-208	208:120	1.73:1	0.5
467-240	240:120	2:1	0.5
467-277	277:120	2.31:1	0.5
467-288	288:120	2.4:1	0.4
467-300	300:120	2.5:1	0.4
467-346	346:120	2.88:1	0.4
*467-480	*480:120	4:1	0.25
*467-600	*600:120	5:1	0.25

468



The 468 Series of potential transformers are designed to give accurate measurement of low voltage systems (up to 600 VAC) by stepping down higher voltages to 110 VAC. Useful for monitoring and measuring incoming building or factory voltages.

Frequency
60 Hz.
*Models designed specifically for 50 hz operations are available with reduced performance. Contact factory for details

Standard Secondary Voltage:
120 Volts
Use with CR Magnetics Transducers

Insulation Level:
600 Volt, 10 kV BIL full wave

Accuracy Class:
+/- 0.6% at all burdens up to 7.5 VA at 1.0 and +/- 1.5% 20 VA burden

Thermal Rating:
75 VA at 30° C . amb., 50 VA at 55°C. amb
Terminals are No. 10-32 screws with one lockwasher and one flatwasher.
Approximate weight 4 lbs.

Regulatory Agencies:

E93779

LR89403

Manufactured to meet the requirements of ANSI/IEEE C57.13

PART NUMBERS

Part Number	Voltage Rating	Turns Ratio	Rec. Primary Fuse Rating
468-069	69.3:120	0.58:1	3.0
468-120	120:120	1:1	2.0
468-208	208:120	1.73:1	1.0
468-240	240:120	2:1	1.0
468-277	277:120	2.31:1	1.0
468-288	288:120	2.4:1	0.75
468-300	300:120	2.5:1	0.75
468-346	346:120	2.88:1	0.75
*468-480	*480:120	4:1	0.50
*468-600	*600:120	5:1	0.40

460

The 460 Series of Voltage transformers are designed to give accurate measurement of low voltage systems (up to 600 VAC) by stepping down higher voltages to 110 VAC. Useful for monitoring and measuring incoming building or factory voltages.

Frequency
60 Hz.
*Models designed specifically for 50 hz operations are available with reduced performance. Contact factory for details

Standard Secondary Voltage:
120 Volts
Use with CR Magnetics Transducers

Insulation Level:
600 Volt, 10 kV BIL full wave

Accuracy Class:
0.6 W, 1.2 X at 60 Hz.

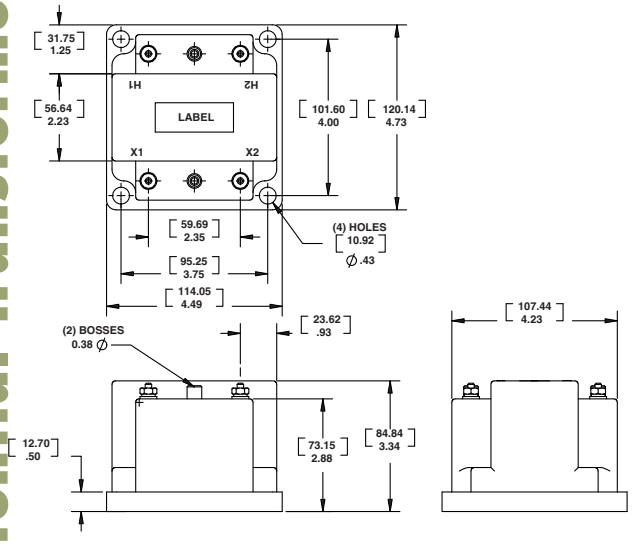
Thermal Rating:
150 VA at 30° C . amb., 100 VA at 55°C. amb
Terminals are No. 10-32 screws with one lockwasher and one flatwasher.
Approximate weight 7.75 lbs.

Regulatory Agencies:

E93779

LR89403

Manufactured to meet the requirements of ANSI/IEEE C57.13

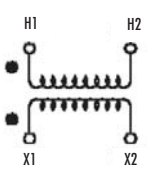


Potential Transformers

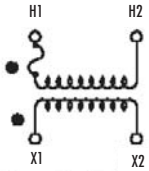
G

PART NUMBERS

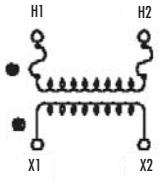
Part Number	Voltage Rating	Turns Ratio	Rec. Primary Fuse Rating
460-069	69.3:120	0.58:1	5.0
460-120	120:120	1:1	4.0
460-208	208:120	1.73:1	2.0
460-240	240:120	2:1	2.0
460-277	277:120	2.31:1	2.0
460-288	288:120	2.4:1	1.5
460-300	300:120	2.5:1	1.5
460-346	346:120	2.88:1	1.5
*460-480	*480:120	4:1	1.0
*460-600	*600:120	5:1	0.75



UNFUSED
TWO BUSHING



ONE FUSE
ONE BUSHING



TWO FUSE
TWO BUSHING

The PT3-1-45 and PT3-2-45 Series of potential transformers are designed to give accurate measurement of medium voltage systems up to 5KV by stepping down higher voltages to 120 VAC. Useful for monitoring and measuring larger power systems and distribution networks containing medium voltage loads.

Frequency
60 Hz.

Maximum System Voltage:
5.6kV, BIL 45kV.
Use with CR Magnetics Transducers

Accuracy Class:
0.3 WX, 0.6 MY,1,2Z at 100% rated voltage with 120V based ANSI Burden
0.6 WX, 1.2 MY at 58% rated voltage with 69.3V based on ANSI burden

Thermal Rating:
600 VA at 30° C . amb., 400 VA at 55°C. amb

Switch gear style is similar to fused style. No fuse or Fuse clip is provided, but inserts for fuse clips are supplied.

Approximate weight 20 lbs., unfused

Regulatory Agencies:

E145172

LR89403

Manufactured to meet the requirements of ANSI/IEEE C57.13

PART NUMBERS

TWO BUSHING (a)				CATALOG NUMBERS			
GROUP	PRIMARY VOLTAGE	RATIO	SECONDARY VOLTAGE	UNFUSED	FUSES	FUSE CLIPS ONLY (d)	SWITCHGEAR STYLE
1	840	7:1	120	PT3-2-45-841	PT3-2-45-841FF	PT3-2-45-841CC	PT3-2-45-841SS
1	1200	10:1	120	PT3-2-45-122	PT3-2-45-122FF	PT3-2-45-122CC	PT3-2-45-122SS
1	2400	20:1	120	PT3-2-45-242	PT3-2-45-242FF	PT3-2-45-242CC	PT3-2-45-242SS
2	3300	30:1	110-50Hz	PT3-2-45-332	PT3-2-45-332FF	-----PT3-2-45-332CC	PT3-2-45-332SS
2	4200	35:1	120	PT3-2-45-422	PT3-2-45-422FF	PT3-2-45-422CC	PT3-2-45-422SS
2	4800	40:1	120	PT3-2-45-482	PT3-2-45-482FF	PT3-2-45-482CC	PT3-2-45-482SS

One Bushing (b)				CATALOG NUMBERS			
GROUP	PRIMARY VOLTAGE	RATIO	SECONDARY VOLTAGE	R_{FR} (c)	FUSES	FUSE CLIPS ONLY (d)	SWITCHGEAR STYLE
4A	2400	20:1	120	190	PT3-1-45-242F	PT3-1-45-242C	PT3-1-45-242S
4B	4200	35:1	120	190	PT3-1-45-422F	PT3-1-45-422C	PT3-1-45-422S
AB	4800	40:1	120	190	PT3-1-45-482F	PT3-1-45-482C	PT3-1-45-482S

(a) Two fuse transformers should not be used for Y connections. It is preferred practice to connect one lead from each voltage transformer directly to the neutral terminal, using a fuse int he line side of the primary only. By using this connection a transformer can never be made "live"from the side by reason of a blown fuse in the neutral side. For continuous operation the transformer primary voltage should not exceed 110% of rated value.

(b) Voltage transformers connected line-to-ground cannot be considered to be grounding transformers and must not be operated with the secondaries in closed delta because excessive currents may flow in the delta.

(c) Values in table are in iohms.

(d) Fuse clips noted as "CC or "C" accept fuses with 1.0" Dia. caps and 5" centers. Fuses clips with a suffix "CCS" or "CS" accept fuses with 0.81 in. caps and 5 in. clip centers

Note: It is recommended that system line-to-line voltage not exceed the transformer maximum system voltage level.

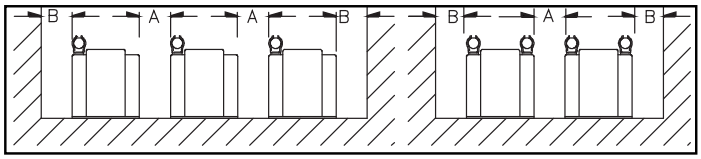
FUSE FOR MODEL PT3 TRANSFORMER	RATING VOLTS	INTERRUPTING AMPERES (SYM)	SUGGESTED RATING CONTINUOUS AMPERES	CAP DIA. INCHES (a)	LENGTH INCHES	CLIP CENTERS INCHES
2400:120V	5.5kV	45,000	2.0E	1.0	5.63	5.00
3300:110V	5.5kV	45,000	2.0E	1.0	5.63	5.00
4200:120V	5.5kV	45,000	1.0E	1.0	5.63	5.00
4800:120V	5.5kV	45,000	1.0E	1.0	5.63	5.00

- Primary terminals that are unfused are 1/4-20 brass screws with one flatwasher and lockwasher.
- Primary terminals that are fused are 1/4-20 brass screws with one flatwasher and lockwasher and two nuts.
- Secondary terminals are No. 10-32 brass screws with one flatwasher and lockwasher.

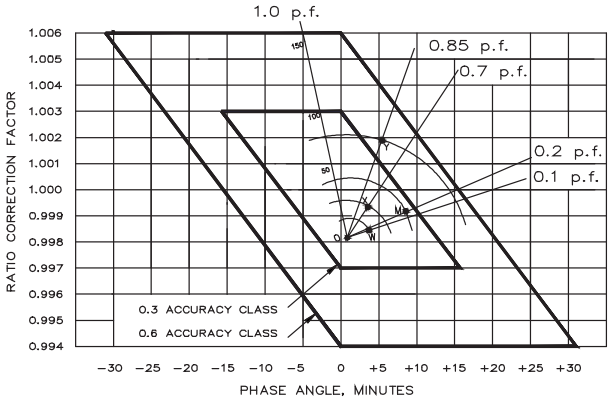
RECOMMENDED MINIMUM SPACINGS

A= Unit to Unit = 0.75" minimum.
B= HV to Ground in air = 3.00" minimum.

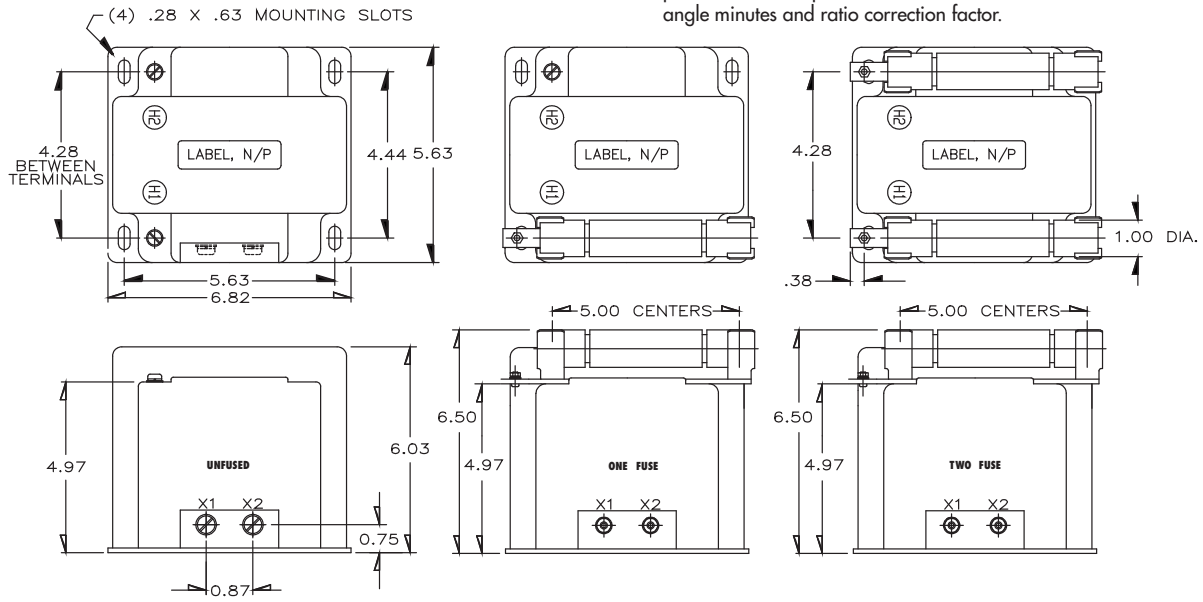
Recommended spacing are for guidance only
User needs to set appropriate values to assure performance for high potential test, impulse test, high humidity, partial discharge, high altitude, and other considerations like configuration.



CIRCLE DIAGRAM



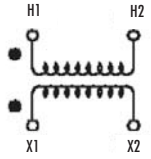
The circle diagram can be used to predict the performance of a transformer for various loads and power factors. A convenient scale of volt-ampere is shown on the unity power line (u.p.f.) and commences at the zero or no-load locus. To use the diagram, measure the known V.A. and scribe an arc about the "Zero" locus of a length that contains the angle of the burden power factor. The point at which the arc terminates is the error locus in phase angle minutes and ratio correction factor.



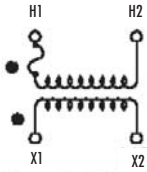
The Professional Energy Monitoring Company
CR MAGNETICS
ISO 9001:2008 Quality Management System
3500 Scarlet Oak Blvd. St. Louis MO USA 63122 V: 636-343-8518 F: 636-343-5119
Web: http://www.crmagnetics.com

E-mail: sales@crmagnetics.com

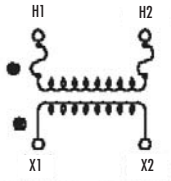
The PTW3-1-60 Series of potential transformers are designed to give accurate measurement of medium voltage systems up to 5KV by stepping down higher voltages to 120 VAC. Useful for monitoring and measuring larger power systems and distribution networks containing medium voltage loads. These devices have increased capability to drive larger VA loads.



UNFUSED
TWO BUSHING



ONE FUSE
ONE BUSHING



TWO FUSE
TWO BUSHING

Frequency
60 Hz.

Maximum System Voltage:
5.6kv, BIL 60kV.
Use with CR Magnetics Transducers

Accuracy Class:
0.3 WXMY, 1.2 Z at 100% rated voltage with 120V based ANSI Burden
0.6 WX, 1.2 MY at 58% rated voltage with 69.3V based on ANSI burden

Thermal Rating:
750 VA at 30° C . amb., 500 VA at 55°C. amb

Approximate weight 34 lbs., unfused

Regulatory Agency:

US
E145172

LR89403

Manufactured to meet the requirements of ANSI/IEEE C57.13

PART NUMBERS

TWO BUSHING (a)				CATALOG NUMBERS			
GROUP	PRIMARY VOLTAGE	RATIO	SECONDARY VOLTAGE	UNFUSED	FUSES	FUSE CLIPS ONLY (d)	SWITCHGEAR STYLE
1	*2400	20:1	120	PTW3-2-60-242	PTW3-2-60-242FF	PTW3-2-60-242CCSorCCL	PTW3-2-60-242SS
2	3300	30:1	110-50Hz	PTW3-2-60-332	PTW3-2-60-332FF	PTW3-2-60-332CCSorCCL	PTW3-2-60-332SS
2	4200	35:1	120	PTW3-2-60-422	PTW3-2-60-422FF	PTW3-2-60-422CCSorCCL	PTW3-2-60-422SS
2	*4800	40:1	120	PTW3-2-60-482	PTW3-2-60-482FF	PTW3-2-60-482CCSorCCL	PTW3-2-60-482SS

One Bushing (b)				CATALOG NUMBERS			
GROUP	PRIMARY VOLTAGE	RATIO	SECONDARY VOLTAGE	R_{FR} (c)	FUSES	FUSE CLIPS ONLY (d)	SWITCHGEAR STYLE
4A	*2400	20:1	120	230	PTW3-1-60-242F	PTW3-1-60-242CSorCL	PTW3-1-60-242S
4B	*4200	35:1	120	230	PTW3-1-60-422F	PTW3-1-60-422CSorCL	PTW3-1-60-422S
4B	*4800	40:1	120	230	PTW3-1-60-482F	PTW3-1-60-482CSorCL	PTW3-1-60-482S

(a) Two fuse transformers should not be used for Y connections. It is preferred practice to connect one lead from each voltage transformer directly to the neutral terminal, using a fuse in the line side of the primary only. By using this connection a transformer can never be made "live" from the line side by reason of a blown fuse in the neutral side. For continuous operation the transformer primary voltage should not exceed 110% of rated value.

(b) Voltage transformers connected line-to-ground cannot be considered to be grounding transformers and must not be operated with the secondaries in closed delta because excessive currents may flow in the delta.

(c) Values in table are in ohms.

(d) Fuse clips noted as "CCS" or "CS" accept fuses with 1.0" Dia. caps and 5" clip centers. Fuses clips with a suffix"CCL" or "CL" accept fuses with 1.63 dia. caps and 5.88" clip centers.

Note: It is recommended that system line-to-line voltage not exceed the transformer maximum system voltage level.

FUSE FOR MODEL PT W3 TRANSFORMER	RATING VOLTS	INTERRUPTING AMPERES (SYM)	SUGGESTED RATING CONTINUOUS AMPERES	CAP DIA. INCHES (d)	LENGTH INCHES	CLIP CENTERS INCHES
2400:120V	5.5kV	45,000	2.0E	1.0	5.63	5.00
3300:110V	5.5kV	45,000	2.0E	1.0	5.63	5.00
4200:120V	5.5kV	45,000	1.0E	1.0	5.63	5.00
4800:120V	5.5kV	45,000	1.0E	1.0	5.63	5.00

- Primary terminals that are unfused are 1/4-20 brass screws with one flatwasher and lock washer.
- Primary terminals that are fused are 1/4-20 brass screws with one flatwasher and lock washer and two nuts.
- Secondary terminals are No. 10-32 brass screws with one flatwasher and lock washer.
- The core and coil assembly is encased in a plastic enclosure and vacuum encapsulated in polyurethane resin.
- Thermal burden rating is for 120 volt secondaries.
- Switch gear style is similar to fused style. No fuse or fuse clip is provide, but inserts for fuse clips are supplied.

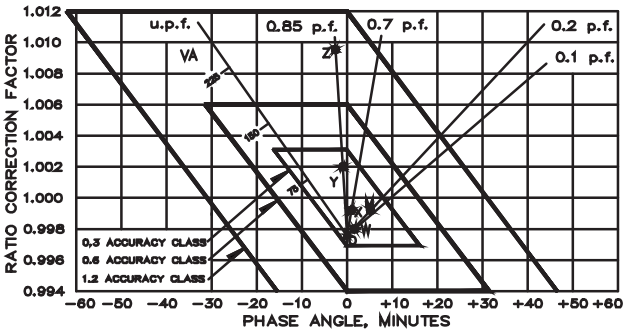
RECOMMENDED MINIMUM SPACINGS

A = Unit to Unit or to Ground = 1.00" minimum.

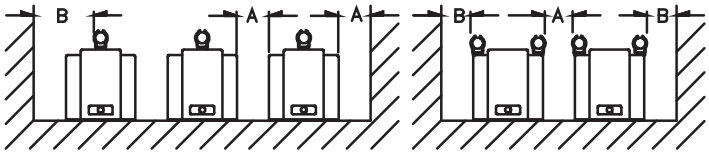
B = HV to Ground in air = 3.00" minimum.

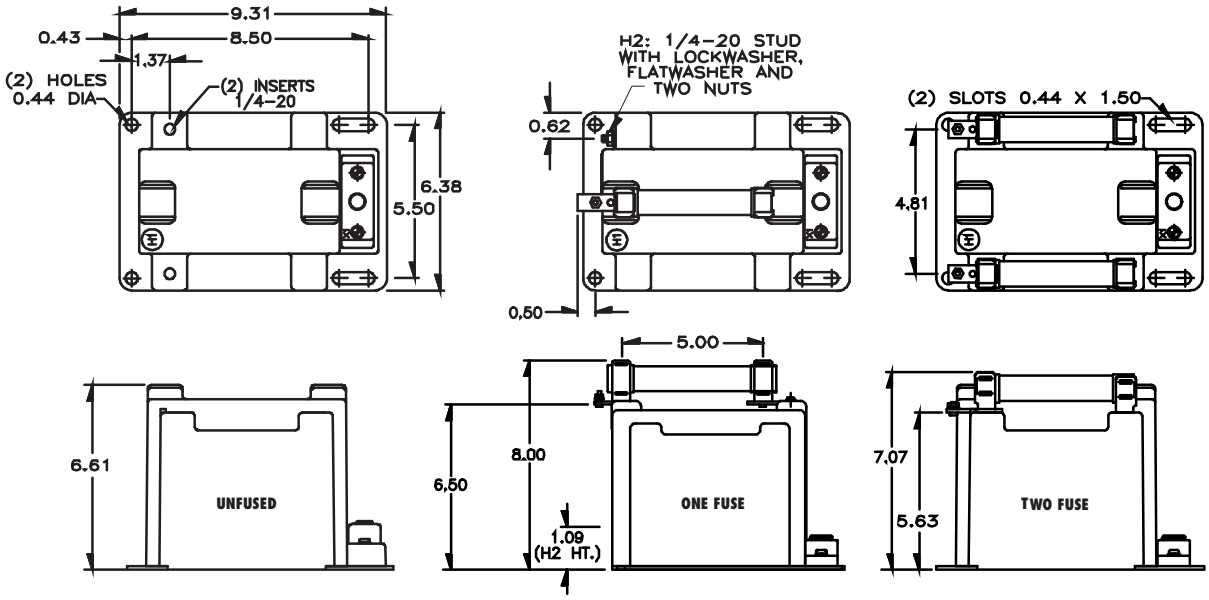
Recommended spacing are for guidance only. User needs to set appropriate values to assure performance for high potential test, impulse test, high humidity, partial discharge, high altitude, and other considerations like configuration.

CIRCLE DIAGRAM



The circle diagram can be used to predict the performance of a transformer for various loads and power factors. A convenient scale of volt-ampere is shown on the unity power factor line (u.p.f.) and commences at the zero or no-load locus. To use the diagram, measure the known V.A. and scribe an arc about the "Zero" locus of a length that contains the angle of the burden power factor. The point at which the arc terminates is the error locus in phase angle minutes and ratio correction factor.



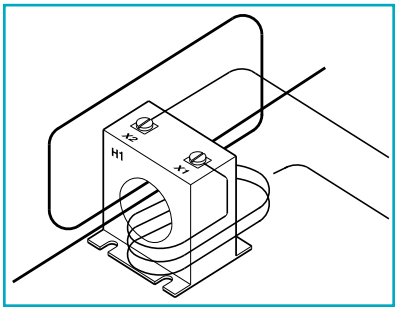


Potential Transformers

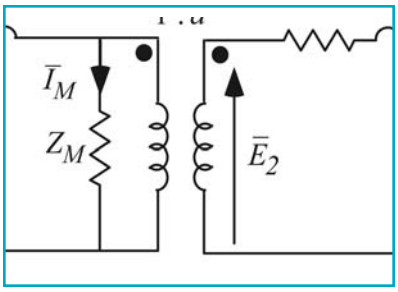
G

Applications, Guides, and References

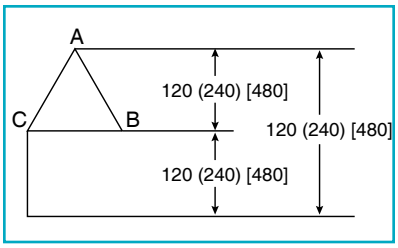
As part of our commitment to customer service, the following pages contain some of the most common application notes, as well as some handy reference material that makes implementing your own instrumentation system easy and fast. All our information is also available for download at www.crmagnetics.com

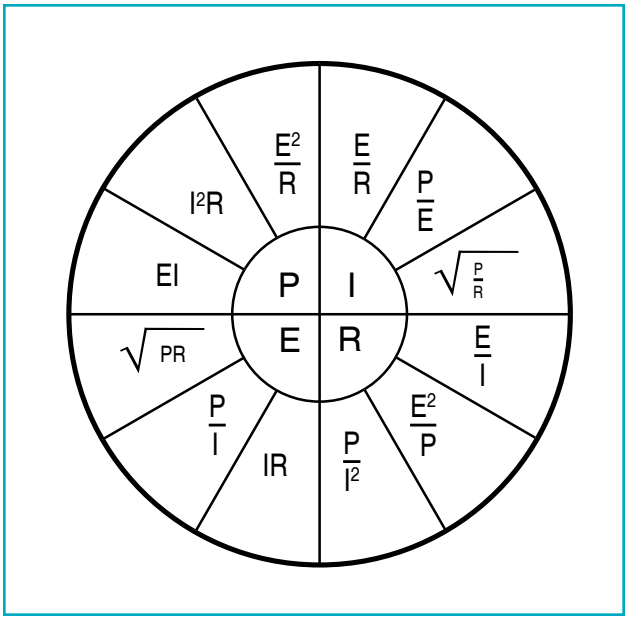


The **Application Guides** are basic applications and design notes for using electrical properties instrumentation products. Included are typical applications of parts, adjusting and understanding transfer functions of sensors and transducers, and design aids and applications to implement full systems.



The **Technical Reference** documents contain handy lookup information on 3 phase and single phase power systems, Ohm's law, and mathematical models of sensors.





All CR Magnetics applications and reference material can be found online

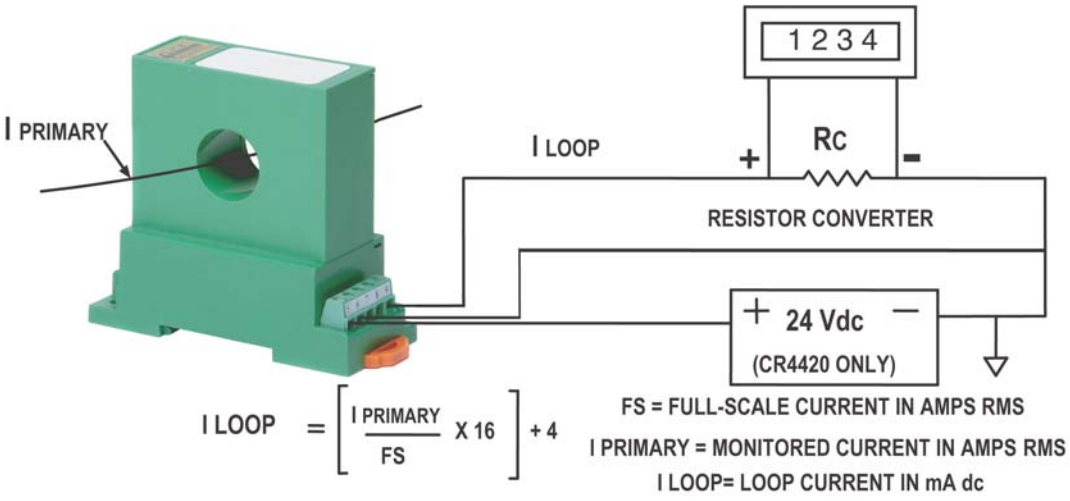
www.crmagnetics.com

www

Just type in crmagnetics.com, and go to the Technical Guides Button!!

Developing Voltage From 4-20mA Current Loops

Many of the Analog Transducers from CR Magnetics provide a 4 to 20mA current loop to communicate sensed values. These loops can be converted to a voltage for input to a wide variety of instrumentation devices including panel meters, data acquisition systems, and programmable controllers. By adding a precision resistor in series with the loop, a voltage is developed, which can then be inputted to the instrumentation. In the diagram below, a current transducer is used to show this concept.



- The tolerance of the resistor is critical. Tolerances of the system are additive – using a 0.5% percent transducer in conjunction with a 1% resistor results in a 1.5% tolerance system.

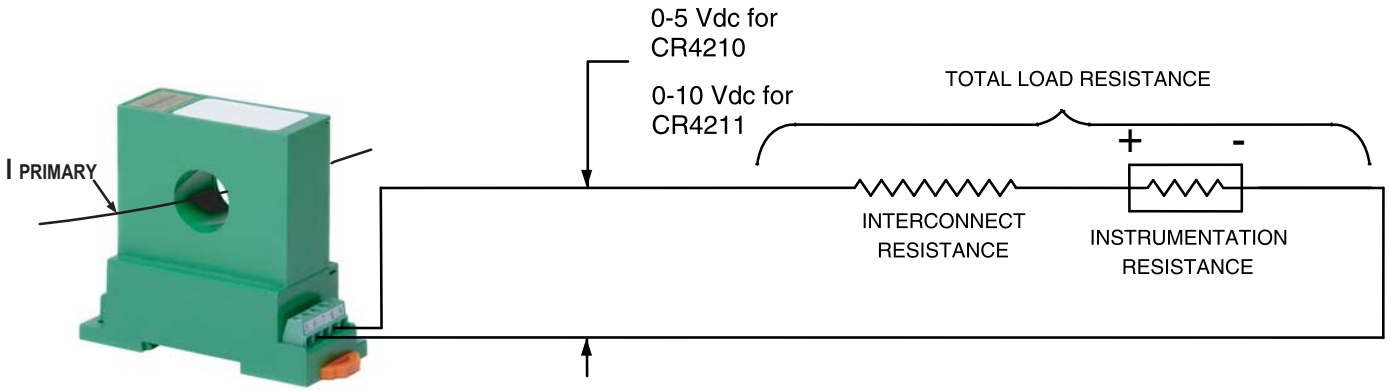
- The temperature coefficient of the resistor is a key factor. All electronic devices exhibit some variance with temperature. If the resistor has a large variance with temperature, the accuracy of the system will also vary with temperature. Self-heating of the resistor must also be considered. A typical design of 5VDC at full scale (20mA) requires a nominal resistance of 250 Ohms (5/.020). The power generated in this resistor at full scale is Volts times Amps or 5 X .020 = .100 Watts. Choosing a 1/8 Watt (.125) resistor will provide reasonable safety against destruction, but will cause a significant temperature rise in the resistor. This rise in temperature can result in significant changes in the value of the resistance. For instrumentation, a resistor with a power rating of at least 10 times the expected full scale power is recommended.

- The resistor should be mounted as close as possible to the instrumentation. Once the signal is converted from current to voltage, voltage drops from wire resistance introduces errors in the signal.

- Whenever possible, use similar materials for all wire connections. Galvanic reactions from dissimilar metals can introduce errors in the readings. An extremely low galvanic reaction such as 5mV introduces a .1% error at 5VDC full scale. Smaller reading levels results in this error being more significant.

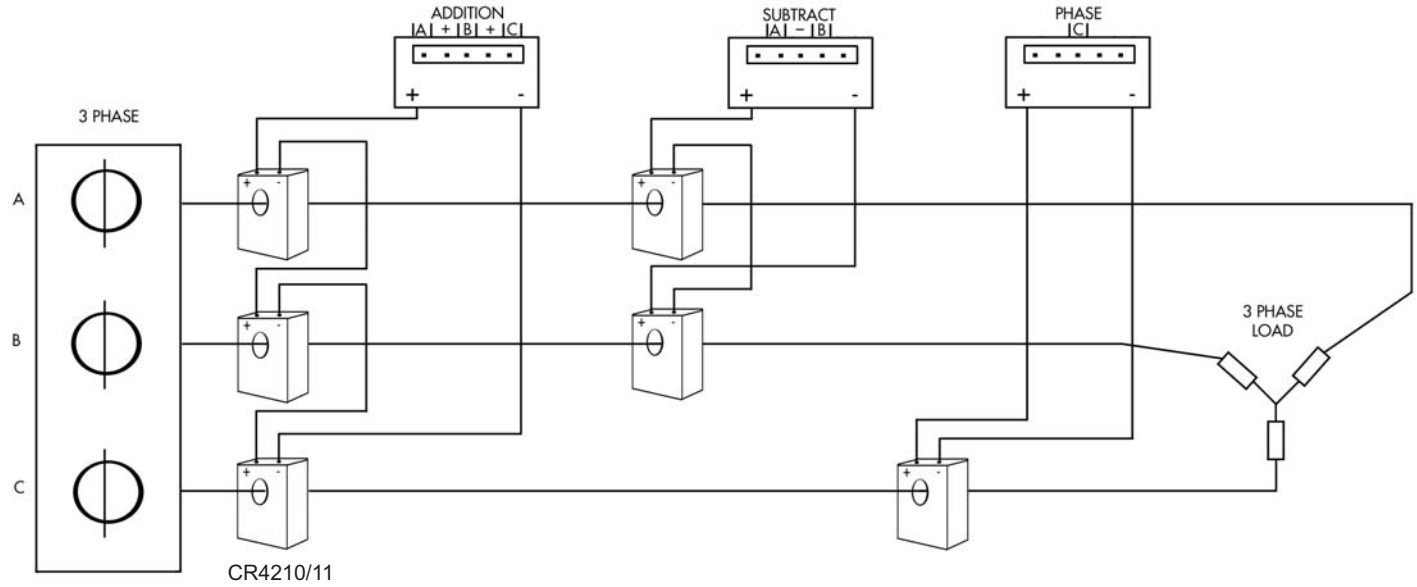
Using the Self Powered CR4210/11 Series Current Transducer

The 4210 and 4211 series transducers are self-powered variable voltage devices that automatically adjust their DC voltage output to maintain a DC voltage that is proportional to the Average RMS Value of the AC current flowing through the window of the transmitter. The 4210 outputs 5VDC and the 4211 outputs 10VDC for full scale AC input current.



- Verify that the correct polarity is observed as shown. The 4210/11 series are polarity protected, so damage should not occur if connected in reverse polarity.
- Insure that the total loop resistance (instrument plus wire) exceeds the minimum load resistance for the range chosen. Most commonly, an instrument with a burden of 1 Meg ohms is chosen. If the total loop resistance is less than required, the transducer will not function according to published specifications.
- Twisted pair wire should be adequate for most applications but shielded/twisted pair wire with the shield grounded at the instrumentation end may be required for the most severe environments. Refer to the instrumentation installation manual for more details regarding interconnect requirements.
- The output is calibrated to be proportional to the Average RMS of the current primary at 60 Hz. Signals from devices such as SCR and variable speed drives will not produce an accurate indication of RMS current levels.
- The first step in troubleshooting would be to check the voltage across all of the components in the loop.
- Transducers may be mounted in close proximity to each other without concern for magnetic interaction.
- An external current transformer may be attached to the transducer for applications that require monitoring current levels above 200 AAC.

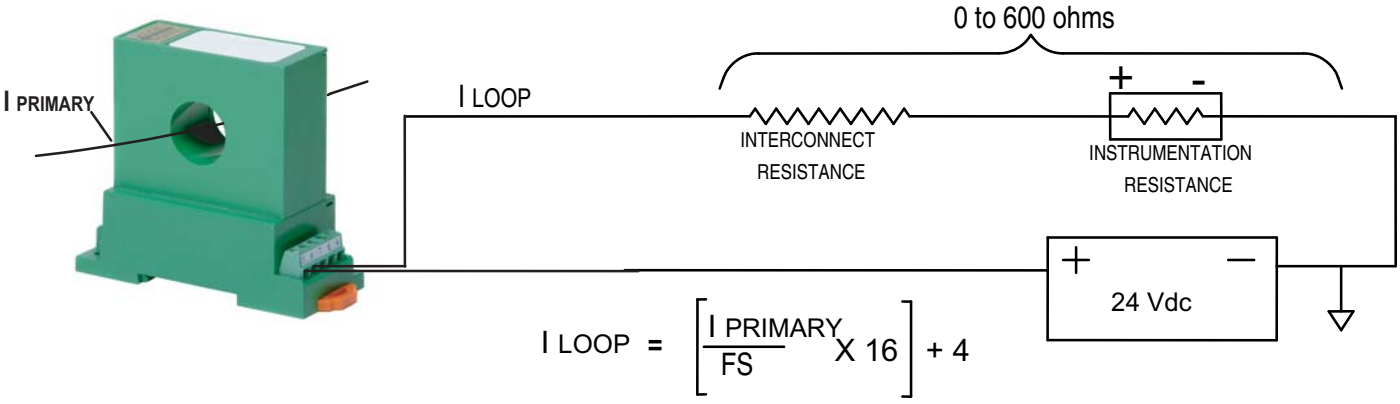
The unique design of the CR4210 Transducer allows the system designer to not only measure individual phase currents, but also combine signals to realize arithmetic functions with a minimum of components and programming. Because of the self-powered floating output feature, voltages can be added and subtracted by simple wiring, and accurate data displayed via programmable scale displays.



- Accurate average three phase current measurement
- Phase imbalance indication Monitor motor load status accurately and simply
- Monitor heater status and balance
- Phase Voltage monitor
- The transducer function of giving DC output voltages for AC input currents loses all phasing information. Absolute values of current are available only.
- Loading limits of the transducer remain as specified. Multiple transducers wired as shown must be capable of handling the instrument impedance on an individual basis.
- Transducers may be mounted in close proximity to each other without concern for magnetic interaction.
- An external current transformer may be attached to the transducer for applications that require monitoring current levels above 200 AAC.

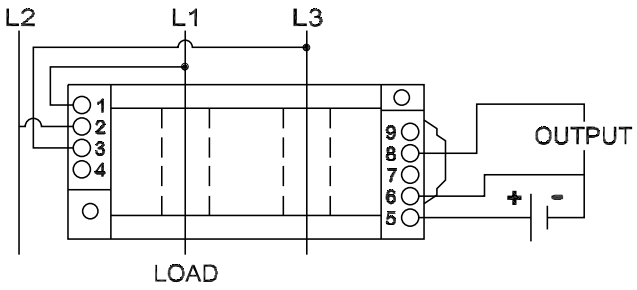
Using the CR4220/60 Series Current Transmitter

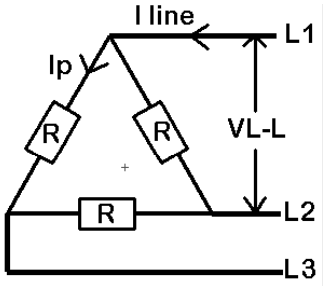
The 4220/60 series are variable resistance devices that automatically adjust their DC series resistance to maintain a DC current that is proportional to the Average RMS Value of the AC current flowing through the window of the transmitter. Since these are variable resistance devices, the 4-20mA loop must derive power from an external DC power supply.



- Verify that the correct polarity is observed as shown. The 4220/60 series are polarity protected, so damage should not occur if connected in reverse polarity.
- Insure that the total loop resistance (instrument plus wire) does not exceed 600 Ohms. Most commonly, an instrument with a burden of 250 Ohms is chosen. If the total loop resistance is greater that 600 Ohms the transducer will not function according to published specifications.
- Choosing connection wire with 22 gauge conductors or larger will minimize connection resistance on most applications. Twisted pair wire should be adequate for most applications but shielded/twisted pair wire with the shield grounded at the instrumentation end may be required for the most severe environments. Refer to the instrumentation installation manual for more details regarding interconnect requirements.
- Verify that the output of the DC supply is at least 24 VDC, with a current rating of 20 ma or greater per transmitter connected.
- The output is calibrated to be proportional to the Average RMS of the current primary at 60 Hz. Signals from devices such as SCR and variable speed drives will not produce an accurate indication of RMS current levels.
- Multiple loop powered transducers may be attached to the same power supply. Attach one side of the power supply common to all the transducers.
- The first step in troubleshooting would be to check the voltage across all of the components in the loop. At no load the voltage across the instrumentation will be its burden resistance times .004.
- Transducers may be mounted in close proximity to each other without concern for magnetic interaction.
- An external current transformer may be attached to the transducer for applications that require monitoring current levels above 400 AAC.

The CR6230 and CR6240 series of Power Transducers gives the designer a simple and effective way to measure and record the instantaneous power usage for 3 – phase 3 – wire loads. These devices are also known as 2 element power transducers. Only two current inputs are needed because 3 – wire power systems do not have a neutral return path, and one of the lines can always be modeled as the sum of the other two. Hence, these Delta connections can be measured with 2 current sense points.



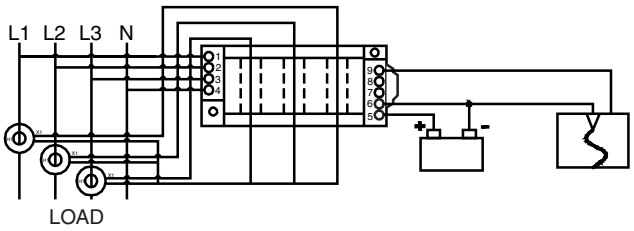


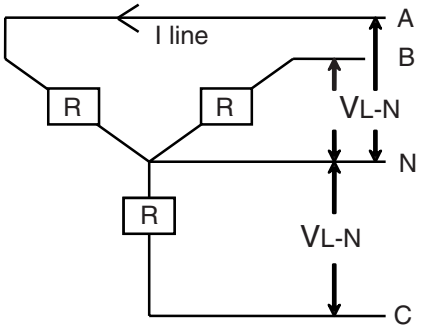
- **Calculation of full scale output:** Using a CR6230-500-5 for example, the unit is calibrated to output the fullscale reading when a balanced purely resistive load is being powered by 500 Vrms line to line, and the amount of current draw on each leg is 5 Arms. Power in any one leg will be the volts across the leg times the current through the leg times the power factor. For calibration, the value of the power factor is unity (1) for a purely resistive load. For the above diagram, the voltage across the element is V L-L, or 500Vrms. The current is Ip, which for balanced loads is I line divided by the square root of 3 (1.732). Thus, the power in one of the legs for a full scale reading using a 500-5 unit would be 500 X 5/1.732 = 1,443 Watts. There are then 3 legs on a 3-phase line, so the total power, full scale would be 3 X 1,445 = 4,330 Watts. The 500-5 transducer will output fullscale (5VDC or 20mA) when the power being used is 4,330 Watts. Using this same methodology, the following simplified formula will give the full scale reading from any Delta transducer: Part number CR6230 – AAA - BB, **Full scale in Watts = AAA X BB X 3 X 1.732.**

- **External current transformers and voltage transformers** can be used to extend the reading range of any transducer. Voltage and current transformers are sized according to turns ratio. A turns ratio on a current transformer of 100:5 represents a turns ratio of 100/5 or 20. Thus for every 1 amp from the current transformer, this represents 20 Amps in the measured line. Since power = V X I X PF (power factor), the amount of power measured when using external current and voltage transformers will be V X I X PF X current ratio X voltage ratio. Using our same example as before, with a CR6230-500-5, if an external current transformer with a ratio of 20 is used, as well as an external voltage transformer with a ratio of 2, then the new full scale output of the transducer will equal 4,330 X 20 X 2 = 173,200 Watts!!! A simplified formula for this situation is: **Full Scale Watts = AAA X BB X 3 X 1.732 X CT ratio X VT ratio.** Please refer to "*Selecting ANSI Class Metering Current Transformers*" and "*Using External Current Transformers with Other CR Devices*" for more information on transformer ratios and applying external transformers to transducers and other devices.

Active Power Measurement with the CR6250/60 Power Transducer

The CR6250 and CR6260 series of Power Transducers gives the designer a simple and effective way to measure and record the instantaneous power usage for 3 – phase 4 – wire loads. These devices are also known as 3 element power transducers. All 3 current inputs are needed because 4 – wire power systems have a neutral return path, and differences in phase currents results in neutral currents, thus requiring all phase information. Hence, these Wye connections must be measured with 3 current sense points.

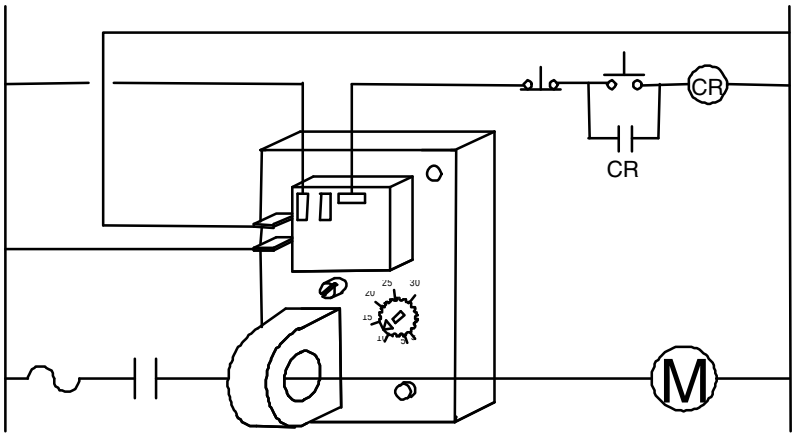




- **Calculation of full scale output:** Using a CR6250-500-5 for example, the unit is calibrated to output the fullscale reading when a balanced purely resistive load is being powered by 500 Vrms line to neutral, and the amount of current draw on each leg is 5 Arms. Power in any one leg will be the volts across the leg times the current through the leg times the power factor. For calibration, the value of the power factor is unity (1) for a purely resistive load. For the above diagram, the voltage across the element is V L-N, or 500Vrms. The current is Ip, which for balanced Wye loads flows through each element. Thus, the power in one of the legs for a full scale reading using a 500-5 unit would be 500 X 5 = 2,500 Watts. There are then 3 legs on a 3-phase line, so the total power, full scale would be 3 X 2,500 = 7,500 Watts. The 500-5 transducer will output fullscale (5VDC or 20mA) when the power being used is 7,500 Watts. Using this same methodology, the following simplified formula will give the full scale reading from any Wye transducer: Part number CR6250 – AAA - BB, **Full scale in Watts = AAA X BB X 3**.

- **External current transformers and voltage transformers** can be used to extend the reading range of any transducer. Voltage and current transformers are sized according to turns ratio. A turns ratio on a current transformer of 100:5 represents a turns ratio of 100/5 or 20. Thus for every 1 amp from the current transformer, this represents 20 Amps in the measured line. Since power = V X I X PF (power factor), the amount of power measured when using external current and voltage transformers will be V X I X PF X current ratio X voltage ratio. Using our same example as before, with a CR6250-500-5, if an external current transformer with a ratio of 20 is used, as well as an external voltage transformer with a ratio of 2, then the new full scale output of the transducer will equal 7,500 X 20 X 2 = 300,000 Watts!!! A simplified formula for this situation is: **Full Scale Watts = AAA X BB X 3 X CT ratio X VT ratio.** Please refer to "*Selecting ANSI Class Metering Current Transformers*" and "*Using External Current Transformers with Other CR Devices*" for more information on transformer ratios and applying external transformers to transducers and other devices.

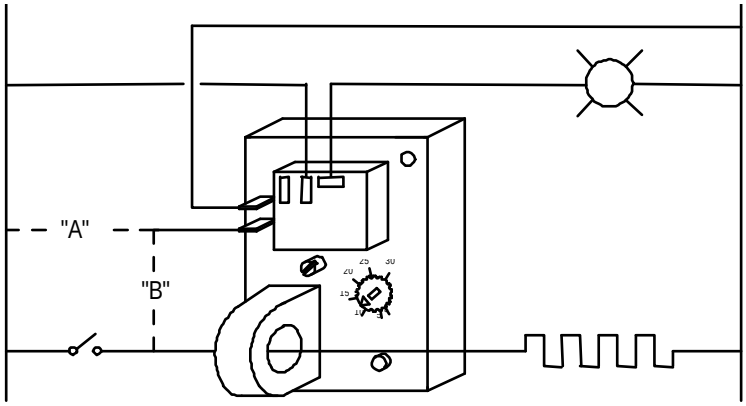
The CR4395 current sensing relay can be used as an effective way to monitor the operational load of a motor. Overloading and underloading can be sensed from primary current levels to trigger alarms, lockouts, and indicators. The EH version (active above setpoint current) can be used for overload, and the EL version (active below setpoint current) for underload.



- The CR4395 can be ordered with three time delay settings, A for .5 to 6 seconds, B for 2 to 20 seconds, and X for no delay. The EH option can utilize the time delay for preventing undesired activation during high motor startup currents.
- The time delay function can also be used for pulsed motor applications in the EL circuit. Here, activation of the relay will occur only if the current to the motor remains below the setpoint for longer than the delay period.
- Both the EH and the EL versions are available with the latching option. When tripped, the relay remains in the activated state until power is reset.
- The CR4395 comes standard with a mechanical relay that provides a Form C single pole contact. Other outputs such as transistor and triac switches are available as options. Typically, the mechanical relay is used to provide higher current switching for other motors and loads, and the solid state options are used to interface with digital and PLC circuitry, which eliminates switch bouncing.
- A combination of time delay setting and setpoint level can implement special indicator functions. Lower time delays, with properly chosen current trip levels can give an indication of motor bearing stress with the EH version. The EL version with longer delays and properly designed trip levels can be used for yield monitors in continuous process industries.
- The CR4395 is an effective tool in protecting and monitoring motors, however, **electrical fuses or other devices may be required for complete circuit protection.**

Detecting Open Heaters and Lamps with the CR4395 Current Sense Relay

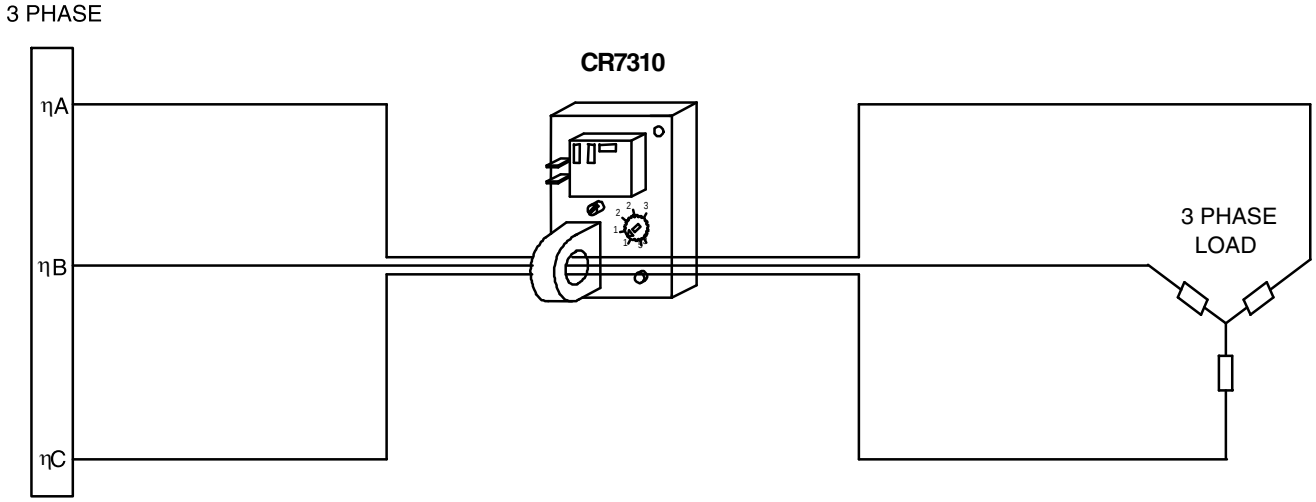
The CR4395 current sensing relay can be used as an effective way to monitor the operational status of heaters and lamps. Most loads of this type have an open circuit failure mode. The EL version (active below set-point)current can be utilized. Upon failure of the load, current ceases, and the relay activates.



- In cases where the current is cycled on and off, as in most heater applications, the connection scheme “B” can provide effective sensing. The CR4395 is powered by the controller output. Used in this fashion, the relay will only monitor the load when the load is active.
- The unique design of the CR4395 guarantees correct sensing of the load as the power is cycled on and off. Using tested power supply designs, the sensing circuitry and trip level are parametrically matched, eliminating false trips and timing problems.
- For continuously powered loads, circuit “A” is used. The output relay can then be used to drive alarms and indicators.
- The CR4395 comes standard with a mechanical relay that provides a Form C single pole contact. Other outputs such as transistor and triac switches are available as options. Typically, the mechanical relay is used to provide higher current switching for other motors and loads, and thesolid state options are used to interface with digital and PLC circuitry, which eliminates switch bouncing.
- A latching version is available that can be used to force reset when a trip occurs. The relay, once tripped, stays tripped regardless of current level sensed, until power is reset. This version is only applicable to circuit “A”, since power is constantly set and reset in circuit “B”.
- Time delay units can be selected for circuit “A” on ‘ some controlled heater applications. The time delay must be set longer than the longest “off” time for proper operation.
- Circuit “B” can only be used on controllers that are “zero-cross” or utilize full cycles of the ac power supply. Phase-fired SCR controls or devices that use portions of the power waveform to regulate power will not function properly.

3 Phase Imbalance/Ground Fault Detection Using the CR7310 Ground Fault Sensor

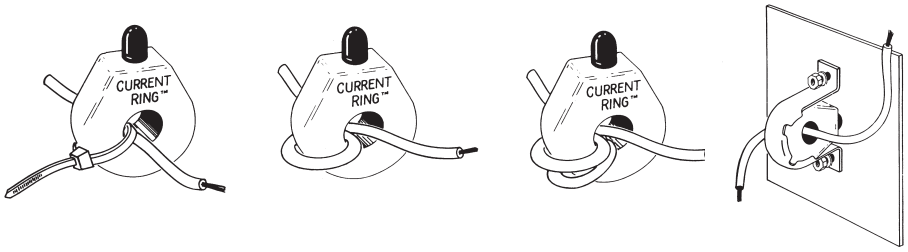
One of the most important applications of the CR7310 relay is to monitor 3 phase imbalances and ground faults. This application can help protect sensitive equipment and minimize losses from equipment failure. All three phases, plus neutrals as shown, are routed through the sensor window.



- 3 Phase Y phase currents by definition must cancel when the loads are equal. Passing all three phases of the Y through the sensor will normally result in zero amperage reading. When an imbalance occurs, the phases do not cancel, and the relay trips.
- This type of imbalance scheme works best due to the fact that all fault conditions, leg to leg, leg to neutral, and leg to ground can be sensed. Sensing only neutral currents will not necessarily indicate a ground fault condition.
- Ground fault indication can only be sensed in a Delta configuration. Leg to leg imbalances are not detectable due to the absence of a neutral return path.
- The CR7310 comes standard with a mechanical relay that provides a Form C single pole contact. Other outputs such as transistor and triac switches are available as options. Typically, the mechanical relay is used to provide higher current switching for other motors and loads, and the solid state options are used to interface with digital and PLC circuitry, which eliminates switch bouncing.
- A latching version is available that can be used to force reset when a trip occurs. The relay, once tripped, stays tripped regardless of current level sensed, until power is reset.
- The CR7310 Ground Fault Sensor is in no way to be considered adequate protection from injury to operators, animals, or other electrically sensitive assets. These devices provide signals and indications that can be applied with other equipment for complete systems. Other fuses and/or electrical devices are required for complete circuit protection.

The CR45 as an Open Heater/Open Winding Indicator

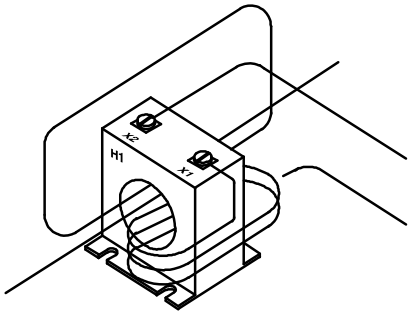
The most popular application of the CR45 indicator is to provide a method of non-intrusive troubleshooting and status indication of heater elements and motor windings. The typical failure mode of heaters and some motors are open circuit. When current flows, the LED is on. When the circuit is open, the LED is not on. This gives an easy method of monitoring the status of the equipment.



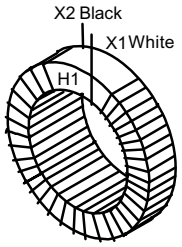
WIRE PASSES	M TURN-ON POINT		AX. WIRE DIAMETER
	RED	GREEN	
1	2.00	2.50	0.29
2	1.00	1.25	0.14
3	0.66	0.83	0.13
4	0.50	0.62	0.12
N	2 / N	2.5 / N	

- The on level of the CR45 can be adjusted by increasing the number of primary turns. The table above gives the size wire and the number of turns that can be used. Dividing the normal one turn on level of 2 amps by the number of primary turns will give the adjusted turn on level.
- The CR45 is designed to be wire mounted using the wire tie provided. For panel mounting, the MB45 is available, along with a rubber grommet for sealing.
- The maximum current that the unit can handle is 100 Amps for a single turn. Using multiple primary turns decreases the maximum allowed by the same rules for adjusting the turn on point.
- For applications where the primary current cannot be routed to an easily viewed spot to use the CR45, please refer to our Remote Indicator line. These separate the LED and the ring sensor to give greater flexibility.
- Care must be taken when using the CR45 within heater environments. The maximum operating temperature of the unit is 70 degrees C.

The ratio of current transformers can be field adjusted to fulfill the needs of the application. Passing more secondary turns or more primary turns through the window will increase or decrease the turns ratio.



$$\text{ACTUAL TURNS RATIO} = \frac{\text{NAMEPLATE RATIO} - \text{SECONDARY TURNS ADDED}}{\text{PRIMARY TURNS}}$$



- Increasing the number of primary turns can only decrease the turns ratio. A current transformer with a 50 to 5 turns ratio can be changed to a 25 to 5 turns ratio by passing the primary twice through the window.
- The turns ratio can be either increased or decreased by wrapping wire from the secondary through the window of the current transformer.
- When using the secondary of a current transformer to change the turns ratio, the right hand rule of magnetic fields comes into play. Wrapping the white lead or the X1 lead from the H1 side of the transformer through the window to the H2 side will decrease the turns ratio. Wrapping this wire from the H2 side to the H1 side will increase the turns ratio.
- Using the black or X2 lead as the adjustment method will do the opposite of the X1(white) lead. Wrapping from the H1 to the H2 side will increase the turns ratio, and wrapping from the H2 to the H1 side will decrease the turns ratio.
- Increasing the turns ratio with the secondary wire, turns on the secondary are essentially increased. A 50 to 5 current transformer will have a 55 to 5 ratio when adding a single secondary turn.
- Decreasing the turns ratio with the secondary wire, turns on the secondary are essentially decreased. A 50 to 5 current transformer will have a 45 to 5 ratio when adding a single secondary turn.
- Decreasing the turns ratio with the primary, accuracy and VA burden ratings are the same as the original configuration.
- Increasing the turns ratio with the secondary will improve the accuracy and burden rating.
- Decreasing the turns ratio with the secondary will worsen the accuracy and burden rating.

Selecting ANSI Class Metering Current Transformers

One of the most common uses of current transformers are in metering and power usage, where a 5 Amp secondary current transformer is applied to a panel meter or a power meter for displaying amperage or recording power. When extremely accurate measurement is required, or when revenue is generated from a power meter, ANSI class current transformers are generally selected. The following table describes the characteristics of the ANSI class transformer.

CURRENT RATIO	ANSI METERING CLASS @ 60 Hz				
	B0.1	**B0.2**	**B0.5**	**B0.9**	**B1.8**
50:5	0.3	0.6	0.9	1.2	2.4

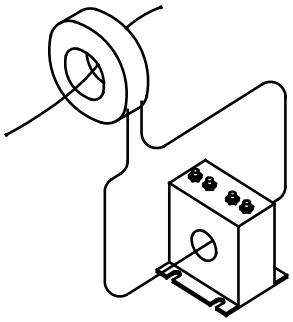
BURDEN IN OHMS

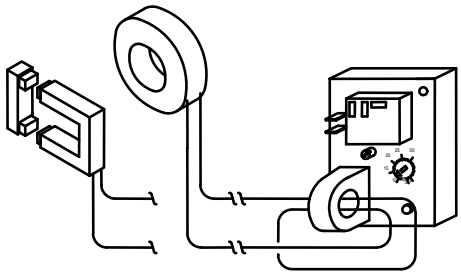
TURNS RATIO

PERCENT ACCURACY

- The primary selection criteria is the burden placed on the secondary of the transformer. This is the impedance of the instrument that is connected to the transformer. This value is generally given in ohms or VA (volt-amps).
- For ANSI class transformers, the headings at the top of the table B0.1 through B1.8 organize the accuracy of the transformer according to the burden placed on the secondary. For example B0.1 means a burden of 0.1 ohms.
- The accuracies listed under the burden values are given in percent. These values are for a full scale reading. Percent accuracy means that the reading received from the transformer at the burden listed will be within the percentage given of ideal. Hence, a 50 to 5 turns ratio transformer with 50 Amps through the window will output 5 amps +/- 0.3% in the secondary into a 0.1 ohm burden. The current in the secondary will be some where between 4.985 and 5.015 amps.
- When the instrument connected gives the burden to the transformer in VA (volt-amps) the table can be used to determine accuracy. Since the transformer has a 5 amp secondary, using Ohm's Law, the impedance can be determined. A burden of 5 VA must be equal to the current squared times the impedance in ohms. Thus, 5VA / (5X5) = 0.2 Ohms. Thus, the accuracy of this transformer-meter system would be 0.6%.
- If the impedance calculated or chosen falls between headings, use interpolation to determine accuracy.
- In general, the lower the burden, the higher the accuracy.
- It is critical to understand that the accuracy ratings are for a full scale reading. This accuracy will only be maintained from 20% full scale and up. Below this, and the accuracy worsens greatly. Always strive to select transformers so that the majority of readings will be within the 20 to 100% full scale range.

Many times, the application requirements do not allow using a single sensor such as a transducer or current sensing relay. The level of the current sensed may be too great, the size of the conductor may be too large, or the location of the sensor may not allow the placement of the transducer. In these cases, a two piece solution can be used, with a remote or external transformer chosen for capacity, size, or location, and a transducer or current sensing relay for input or control.

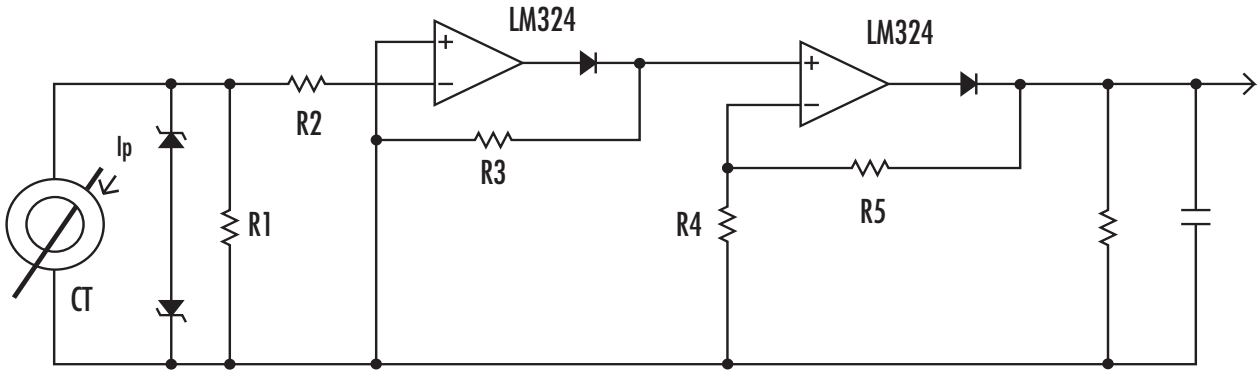




- Typically, a standard 5 amp secondary current transformer is selected. These transformers integrate easily with the 5 amp input transducers, transmitters and relays.
- The accuracies listed under the burden values are given in percent. These values are for a full scale reading. Percent accuracy means that the reading received from the transformer at the burden listed will be within the percentage given of ideal. Hence, a 50 to 5 turns ratio transformer with 50 Amps through the window will output 5 amps +/- 0.3% in the secondary into a 0.1 ohm burden. The current in the secondary will be somewhere between 4.985 and 5.015 amps.
- When the instrument connected gives the burden to the transformer in VA (volt-amps) the table can be used to determine accuracy. Since the transformer has a 5 amp secondary, using Ohm's Law, the impedance can be determined. A burden of 5 VA must be equal to the current squared times the impedance in ohms. Thus, 5VA / (5X5) = 0.2 Ohms. The accuracy of this transformer-meter system would be 0.6%.
- If the impedance calculated or chosen falls between headings, use interpolation to determine accuracy.
- In general, the lower the burden, the higher the accuracy.
- It is critical to understand that the accuracy ratings are for a full scale reading. This accuracy will only be maintained from 10% full scale and up. Below this, and the accuracy worsens greatly. Always strive to select transformers so that the majority of readings will be within the 10 to 100% full scale range.

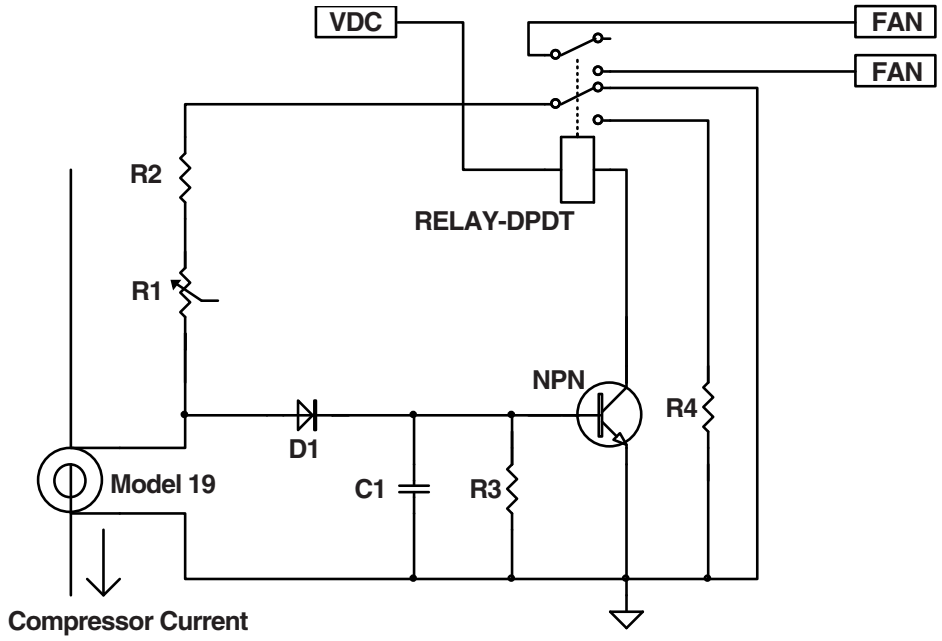
Precision Rectifier Circuit for CT Signal Conditioning

Many times, the designer wishes to generate a DC signal from an AC current transformer for input to a PLC or data acquisition system, or even as part of a current or motor controller. Creating DC from an AC source creates problems with diode voltage drops and the variances over temperature and current. The following circuit provides an accurate method for creating this DC signal.



- The CT secondary current is applied to the resistor R1, which generates a voltage equal to the primary current divided by the turns ratio and multiplied by the value of R1. This AC voltage is rectified by the first op amp, and then amplified by the second op amp.
- The gain of the first stage is always kept at 1 or unity (R2 = R3) to guarantee symmetry of the rectified waveform. R2 should be chosen at least 10 times greater than R1 for proper accuracy.
- The gain of the second stage is R5/R4 + 1. This gain is chosen to get the desired output DC voltage for the designed input voltage.
- The main advantage of this circuit is the removal of the diode drop as a variance in the signal. DC can be generated directly from R1 by applying the AC voltage to a diode bridge. However, the AC voltage required to do this must be greater than 2 diode voltage drops, or over 2 VAC. This limits the designer to use a silicon steel core that can generate enough voltage before going into saturation. By using the above circuit, the AC voltage input can be very low (10-100 mV) and then amplified to the level desired. This then allows the designer to choose smaller core devices and nickel core devices which saturate at low voltages. Accuracy and cost are both improved.
- Use standard op amp design guidelines when setting up this circuit. Keep resistors at 1 M ohm or less, and keep gains to 100 or less.
- The output must be filtered for pure DC. The RC output network shown should be designed with a time constant at least 10 times greater than the period of the waveform sensed. For 60 Hertz, use a time constant of 1/6. For 400 Hz, use a time constant of 1/40, minimum.

This application can be used to control many different devices. In this example, a compressor current is sensed, and when it reaches a selected set point, the circuit turns on a relay, which controls a fan motor. The circuit is generated with a minimum number of parts, and includes hysteresis.



- The CT secondary current is applied to the resistors R1 and R2, which generates an AC voltage that is half wave rectified by D1, and then turns on the NPN transistor. The transistor then turns on the DPDT relay, which energizes the fan motor with one pole of the relay. The other pole of the relay is used to insert R4 into the series R1 and R2 resistance. This immediately raises the voltage at the anode of D1, thus creating the necessary hysteresis.
- C1 provides energy storage to keep the transistor in the on state during half wave inputs. R3 discharges C1 to aid in turn off.
- The transistor should be selected keeping in mind the current gain factor, Hfe, and the turn on voltage, Vbe.
- This should be weighed against the amount of secondary current received from the Model 19. Typically, a Darlington transistor is chosen for the appropriate gain.
- This design can also be applied using a bilateral silicon switch, instead of the relay shown. The transistor activation can be used to turn on two bilateral switches, one to control a motor, and the other to provide the hysteresis.

Technical Terms

Accuracy	The degree of uncertainty with which a measured value agrees with the ideal values. Accuracy class of instrument transformers are defined by the requirements of ANSI standard number C57.13. Standard metering accuracy classes are 0.3, 0.6 and 1.2.
Ambient Temp	Temperature of the surrounding air.
Apparent Power	The product of the applied voltage and current in ac circuit. Apparent power, or volt-amps, is not the true power of the circuit since power factor is not considered in the calculation.
Auxiliary Power	A power source, other than that producing the measured input quantity, which supplies the power necessary for the correct operation of the transducer.
Average RMS Responding	The measurement of an AC voltage or current obtained using a DC instrument with a rectifying input circuit that converts AC energy to DC. The meter scale or readout is usually calibrated in terms of the corresponding RMS values, but is accurate only for pure sinewave inputs.
Burden	In current or potential transformers burden in VA is the maximum load the transformer can support while operating within its accuracy rating.
Calibration	Adjustment of a transducer so the output is within a specified range for particular values of the input.
Current Transformer	An instrument transformer used to accurately scale ac currents up or down, or to provide isolation. Generally used to scale large primary or bus currents to usable values for measuring (or control) purposes. The current measurement range is expressed as the ratio of full scale primary current to full scale secondary current. The primary winding is connected in series with the conductor carrying the current to be measured or controlled. There are two classification of current transformers. Window type and Wound Primary type. In Window type current transformers the primary winding is provided by the line conductor and is not an integral part of the transformer. In Wound Primary type the primary winding is an integral part of the transformers and usually consist of more that one turn. Wound Primary transformers are used in applications that require very high accuracies or where high voltage isolation is required.
Delay on Energization	A term describing a mode of operation relative to timing devices. Delay begins when the initiate switch is closed, or on application of power to the input. Same as Delay on Make.
Delay on Make	Same as delay on energization.
Dielectric Strength	The continuous voltage a dielectric can withstand without deteriorating.

Technical Terms (cont.)

Effective Power	In ac measurements, effective power (measured in watts) equals the product of voltage, current and power factor (the cosine of the phase angle between the current and the voltage).
Full Scale (F.S.)	The specified maximum value of the input quantity being measured that can be applied to a transducer with out causing a change in performance beyond specified tolerance.
Full Scale Output	The specified maximum output value for which the stated accuracy condition applies.
Guaranteed Range	Refers to a range of adjustment or operating range whereby the control device must at least operate or cover the "guaranteed" range.
Hysterisis	An error resulting from the inability of an electrical signal or mechanical system to produce identical readings or position when approached slowly from either direction. Also referred to as deadband.
Impedance	The opposition in an electrical circuit to the flow of alternating (AC) current. Impedance consists of ohmic resistance (R), inductive reactance (X_L), and capacitive reactance (X_C).
Inrush	The initial surge of current through a load when power is first applied. Lamp loads, induction motors, solenoids, contactors, valves, and capacitive loads all have inrush currents higher than the normal running or steady state currents. Resistive loads, such as heater elements, have no inrush.
Instrument Transformer	A transformer which is intended to reproduce in its secondary circuit, in a definite and known proportion, the current or voltage of its primary circuit with the phase relations substantially preserved.
Isolation	To be electrically separate. A measure of the strength of the dielectric providing the electrical division or separation.
Linearity	A measure of departure from straight-line response in the relationship of two quantities, where the change in one is directly proportional to a change in the other. Normally expressed as a maximum percentage.
Loop Powered	The transducer uses the power supplied to the output current measuring loop. No auxiliary power supply is required.
Loop Resistance	The electrical resistance, in ohms, of a complete transducer circuit exclusive of an instrument's internal resistance.
Non-Linearity	In an ideal system, the input-output relationship between variables is linear(i.e. straight line) Any departure from straight line is expressed as non-linearity.

Technical Terms (cont.)

Operating Voltage	A nominal voltage with a specified tolerance applied. The design voltage range to remain within the unit's operating tolerances.
Phase Angle	The difference in time by which an alternating signal lags or leads another signal. Phase angle may be a measure of power factor when used to indicate the relationship of a voltage to current signal for a non-resistive load. Phase angle may also be used to measure the different in phase between the primary and secondary of a current or voltage transformer.
Polyphase Wattmeter	A wattmeter consisting of 2 or 3 single phase wattmeters mounted in the same package. The watt sensing elements can be electronic transducers. A dual element wattmeter will measure power in a 3 phase system regardless of power factor, voltage or current variations between phases. Most common types are 2,2 1/2 or 3 element forms. In 4 wire circuits, with the 4th wire carrying current, the 2« or 3 element type is used. If there is voltage imbalance, only the 3 element units can be employed.
Power	A source or means of supplying energy. The unit of measurement is the watt. 1 Horsepower is equal to 745.7 Watts.
Range	Nominal operating limits, specified by the lowest calibration point to the highest calibration point.
Rated Output	The output at standard calibration
Ratios	The relationship between the primary input value divided by the secondary output value. For example: a current transformer that has a primary input value of 100 Amps and a secondary value of 5 Amps will have a Current Ratio of 100:5 and a Turns Ratio of 20:1. It is important to use the term Current Ratio for most applica tions because it defines the current handling capacity of wire used in the secondary winding. The Turns Ratio only refers to the winding ratio and does not define the current handling capacity of the either primary or secondary windings.
Real Power	Same as Effective Power.
Reactive Power	A component of apparent power (volt-amps) which does not produce any real power (watt) transfer.
Repeat Accuracy	The maximum deviation from one timing operation to the next.
Self Powered	The power required for correct operation of a transducer is supplied via the line being measured.
Separately Powered	The power required for correct operation of a transducer is supplied via an external or auxiliary power source, rather than via the line being measured.

Technical Terms (cont.)

Setting Accuracy	The ability to accurately set a knob, switch, or other adjustment to the time delay, or other monitored parameter.
Snubber Network	A form of suppression network which consists of a series connected resistor and capacitor connected in parallel with the output device. Helps to limit the maximum rate of rise of a voltage. Used to prevent false turn-on of solid state outputs.
Snubber	A resistance/capacitor or diode/resistor circuit used to dissipate transient energy peaks.
Transducer	A device for converting an electrical signal into a useable direct current or voltage for measurement purposes.
RMS	The effective value of alternating current or voltage. The RMS value equates an AC signal to a DC signal which provides the same power transfer.
True RMS Amps	The effective value of an AC signal. For an amp signal, true RMS is a precise method of stating the amp value regardless of waveform distortion. An AC measurement which is equal in power transfer to a corresponding DC current.
True RMS Volts	The effective value of an AC signal. For a voltage signal, true RMS is a precise method of stating the voltage value regardless of waveform distortion. An AC measurement which is equal in power transfer to a corresponding DC voltage.
Unbalanced Loads	Refers to an unequal loading of the phases in a 3 phase system (current and/or phase angle).
Watt	Unit of electrical power. WATTS=E*I*PF
VA	The product of the RMS voltage applied to a circuit and the RMS current, in amperes, flowing through it.
VAR(Volt-Amperes Reactive)	The unit of reactive power as opposed to real power(watts).

UNDERSTANDING CURRENT TRANSFORMER RATIO ERROR AND EXCITATION CURVES

A current transformer follows all the standard physical laws for electrical transformers. The primary winding is usually a very low impedance and therefore treated as a "brute force" constant current source. Faraday's law of ampere-turn balance states that the number of turns in the primary winding times the primary current must equal the number of turns in the secondary winding times the secondary current. Therefore, since the primary is a constant current source, the secondary becomes a constant current source proportional only to the turns ratio.

Other factors come in to play that affect the basic Faraday's relationship, such as the non-linear properties of the core material, eddy current, hysteresis and IR losses. As Figure 1 illustrates, the eddy current and hysteresis losses act to shunt current across the transformer secondary and are defined as excitation losses I_E. Since the excitation losses are non-linear, they are determined from an Excitation Curve provided by the transformer's manufacturer. The I_R losses act as a resistance R_S in series with the secondary winding.

As Figure 2 illustrates, the secondary voltage E_S is found on the vertical axis and the secondary exciting current I_E can be found on the horizontal axis. This exciting current can best be described as the current that contributes to the current transformation ratio error.

Power transformers use the terms "Load" and "Regulation" to describe their operation. Current transformers use the terms "Burden" and "Accuracy" respectively to describe similar functions. Burden defines the connection made to the secondary winding to differentiate it from the primary connection that is generally described as the Load. Current transformers use the term Accuracy to describe what would generally be considered Regulation with a power transformer. It is important to remember that Burden and Accuracy are interdependent; generally the lower the Burden resistance, the better the Accuracy.

Designs that have the current transformer separate from the instrumentation resistor R_I need to consider transformer ratio error. An example would be an ampere meter that uses an external current transformer. The transformer must have an accurately-defined current ratio to allow for interchangeability with other transformers of the same rating.

Designs that have the current transformer as an integral part of the instrumentation can place less emphasis on ratio error and consider more on the transformer's linearity. An example would be a printed circuit-board-mounted current transformer that inputs into an operational amplifier circuit. Ratio error can generally be minimized during calibration with adjustment to the offset and gain controls. The major concern to the overall accuracy of the design would then be linearity of the transformer through out the operating range.

In practice, the designer must consider various factors in selecting a current transformer: since the secondary is operating as a constant current source, a Burden resistor of lower value will provide improved accuracy but decrease instrumentation voltage (V=IR). As the instrumentation voltage is increased with a high Burden resistor, the power dissipated may become a factor ($P = I^2 R$). Generally the designer determines the lowest voltage the electronics can handle considering such parameters as circuit noise and gains. Then the value of the burden resistor can be determined, knowing the characteristics of the current transformer and overall design requirements.

UNDERSTANDING CURRENT TRANSFORMER RATIO ERROR AND EXCITATION CURVES

An example of calculating the actual secondary current, instrumentation voltage and error percentage is as follows:

Determine the total burden terminal resistance R_B across the secondary of the current transformer.This includes the secondary instrumentation resistance R_I and any resistance in the interconnecting leads RL.

For: R_I = 0.02 ohm & R_L = 0.01 ohm R_B =.02 +.01 = .03 ohm

Add the total burden resistance to the secondary winding DC resistance R_S.From figure 2 for a 200:5 current ratio transformer:

R_S = 0.034 ohms.03 + 0.034 = .064 ohms

Select a value of secondary current at a point you desire to determine the ratio error

For: I_S = 3.75 A

Calculate the secondary voltage E_S required for the current to flow through the total secondary resistance.

$E_S = I_S \times R$ E_S = 3.75 x 0.064 = .24 V

Find the secondary voltage E_S on the vertical scale of the excitation curve and read over to the 200 line and down to the horizontal scale for the secondary exciting current I_E.

I_E = .013 A

The primary current will be the turns ratio times the sum of the exciting current and the secondary current

$I_P = N_S / N_P \times (I_E + I_S)$. Ip = 40 x (.013 + 3.75) = 150.52 A7.

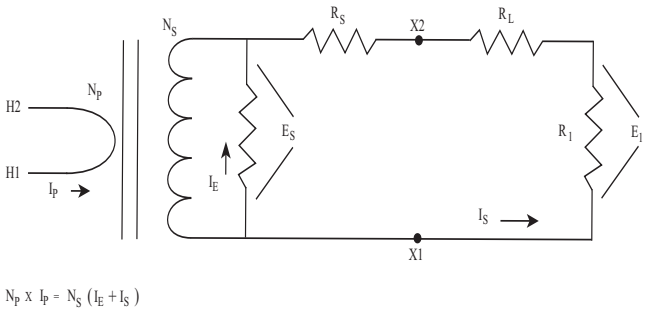
The voltage developed across the instrumentation resistor will be the secondary current times the instrumentation resistor

$E_I = I_S \times R_I$.E_I =3.75 x .02 = 0.075 V

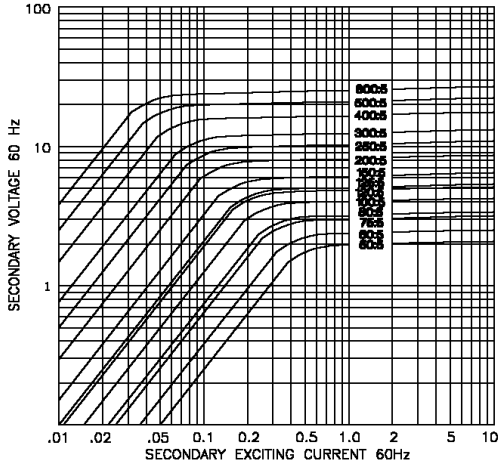
To calculate the percentage ratio error,divide the exciting current by the secondary current times 100.

I_E / I_S x 100..013 / 3.75 x 100 = 0.35 %

CURRENT TRANSFORMER RATIO ERROR AND EXCITATION CURVES



$N_P \times I_P = N_S (I_E + I_S)$



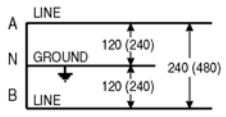
AC MOTOR LOAD CHART

	MOTOR FULL LOAD CURRENTS									MAXIMUM LOCKED ROTOR CURRENTS					
	SINGLE PHASE		3-PHASE A.C. INDUCTION							3-PHASE A.C. INDUCTION					
HP	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		
11/2	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		
71/2	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						

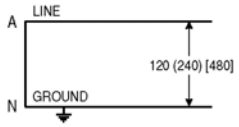
*This information provided as reference only. Consult motor manufacturer and related standards for additional information.

U.S. Standard Voltages

SINGLE-PHASE

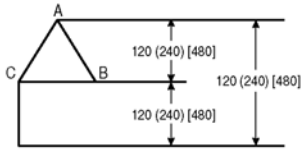


120/240 V, 3 W (240/480 V, 3 W)
THREE-WIRE

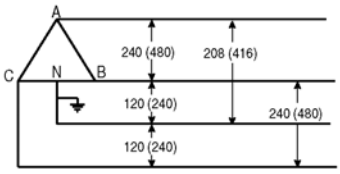


120 V, 2 W (240 V, 2 W) [480 V, 2 W]
TWO-WIRE

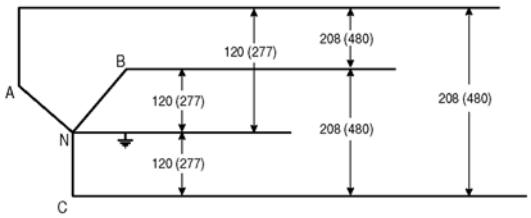
POLYPHASE



120 V, 3 W (240 V, 3 W) [480 V, 3 W]
THREE ELEMENT, THREE-WIRE



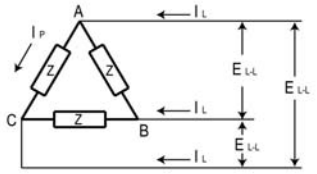
240/120 V, 4 W (480/240 V, 4 W)
THREE ELEMENT, FOUR-WIRE DELTA



208Y/120 V, 4 W (480Y/277 V, 4 W)
THREE ELEMENT, FOUR-WIRE WYE

3 Phase Balanced Loads

3-Phase Delta



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

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

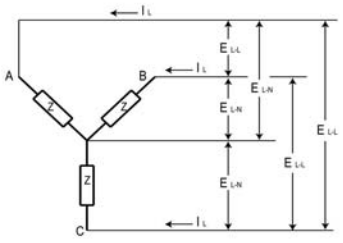
$$I_P = \frac{I_L}{1.73}$$

- 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 $E_{L\text{-}L}$.
- 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 120Þ out of phase.
- The currents in the elements are 120Þ out of phase.
- The power is equal to $\sqrt{3}$ times voltage across each element times the current I_L times COS Θ.

P = power in watts

Θ = phase angle in degrees

3-Phase WYE



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

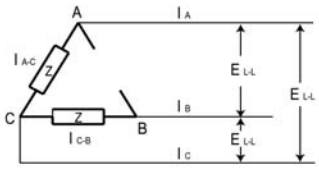
$$I_L = \frac{E_{L\text{-}N}}{Z} = \frac{E_{L\text{-}L}}{1.73\ Z}$$

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

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

3 Phase Unbalanced Loads

3-Phase Delta



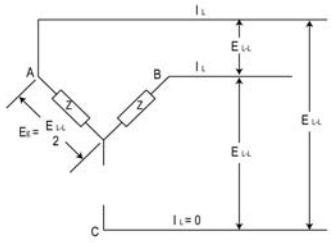
$$P = \frac{2(E_{L\text{-}L})^2}{Z}$$

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

$$I_C = 1.73\ I_A = 1.73\ I_B$$

- 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)



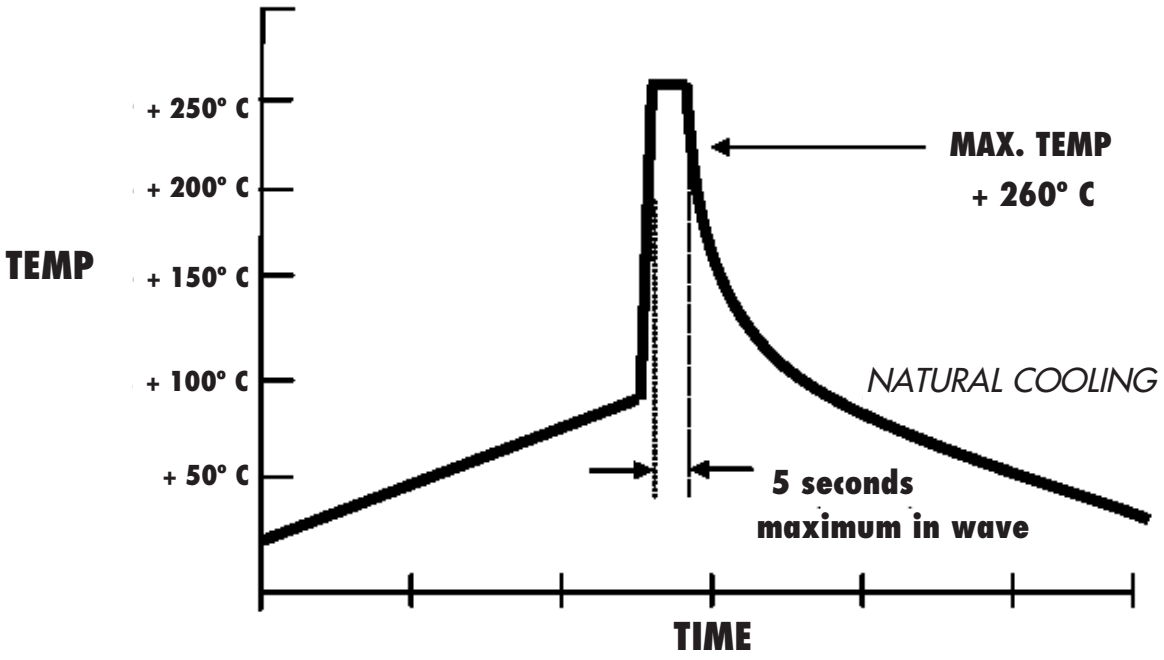
$$P = E_{L\text{-}L}\ I_L\ \text{COS}\ \theta$$

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

- 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 Θ.

Products: CR8300 Series PCB Mount Current Transformers

Pb-Free Soldering Process



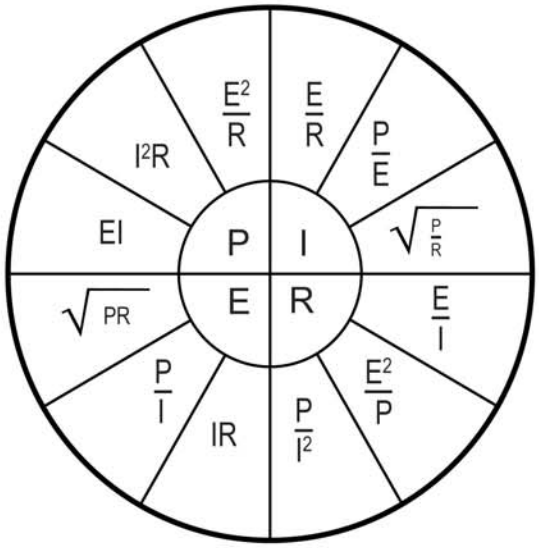
The above flow-wave soldering profile applies to all CR8300 and Custom CR8400 PCB Mount Current transformers.

The temperatures shown above, reflect the conditions seen by the component lead wires

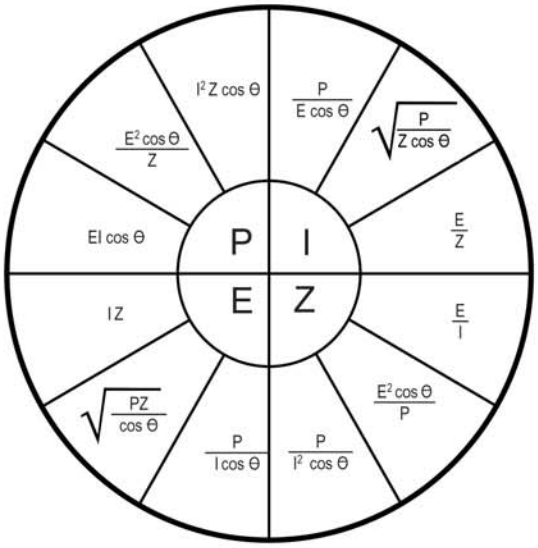
Exposure of the component body to excessive heat during curing, preheat and soldering operations, may result in damage to the component.

It is recommended that leaded components be installed after relow soldering of surface mount components is completed.

DC Systems



AC Systems



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IEEE Publication 76 CH1130-4 PWR
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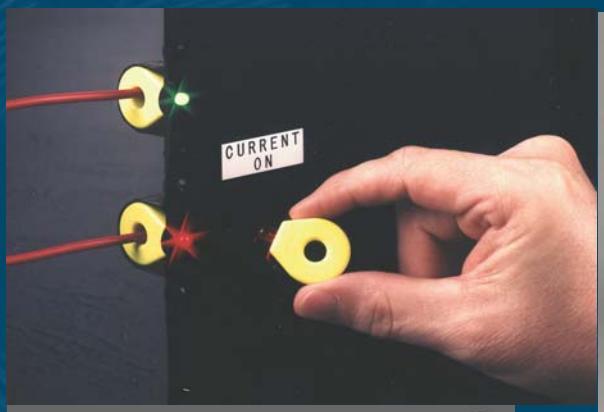
Electrical Systems Measurement and Monitoring Products



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