



Current Transformer (CT) Selection Guide

January 18, 2017

Contents

1	Introduction	3
1.1	Interpreting CT models and SKUs	3
2	Determining how many CTs to use	4
3	Selecting the mechanical dimension of the CT	5
4	Selecting the current rating of the CT	5
5	Revenue Grade CTs	6
6	Rope CTs	6
7	Direct Current CTs	6
8	Extending CT leads	6
9	Three-phase inverter notes	7

10 Appendix	8
10.1 CT dimensions	8
10.1.1 JD-SCT-xxx-xxxx dimensions	8
10.1.2 AE-RCT-xxx-xxxx Dimensions	9
10.1.3 JD-RCT-115-4085 (4.53"ID) dimensions	10
10.1.4 ML-RCT-150-4800 (6"ID) dimensions	11
10.1.5 ML-SCT-010-xxx dimensions (0.4"ID)	12
10.1.6 ML-SCT-019-xxx to ML-SCT-050-xxx (0.75" to 2.00"ID)	13
10.1.7 CC-ACT-020-xxxx dimensions (0.79"ID)	14
10.1.8 CC-ACT-032-xxxx dimensions (1.25"ID)	15
10.1.9 CR-Dxx-xxxx dimensions (0.79" and 1.22"ID)	16
10.2 Full table of supported CTs	17

1 Introduction

This guide is intended to help you select the right quantity and type of current transformers (CTs) needed for an eGauge installation.

A typical eGauge installation will measure the amperage of multiple conductors via multiple CT sensors. The CT sensors are installed around the current carrying conductors of the load or generation source you wish to monitor.

Picking the type of CT involves selecting the *mechanical dimension* and the *current rating* (in Amps).

CTs can be used to monitor the main utility feed conductors for a facility or residence, conductors that feed sub panels, and conductors for individual circuits such as pumps, motors, air conditioning, car chargers, and lighting loads. CTs can also be used to monitor conductors from generators as well as renewable energy systems such as solar PV systems, wind generators and hydro power systems.

1.1 Interpreting CT models and SKUs

The eGauge SKU identifies CTs based on 4 CT properties: Manufacturer (MFG), CT type (TYPE), inner diameter in millimeters (ID), and amperage rating (AMPS). The format of the SKU is MFG-TYPE-ID-AMPS.

MFG code: Manufacturer:

JD	J&D Electronics
AE	AccuEnergy
ML	Magnelab
CC	Continental Control Systems
CR	CR Magnetics

TYPE code: CT type:

SCT	Split-core CT
RCT	Rogowski coil (rope CT)
DCT	Solid-core DC (direct current) CT
DSC	Split-core DC (direct current) CT
ACT	High-accuracy split-core CT

For example, the SKU JD-SCT-010-0075 defines:

Manufacturer: J&D Electronics
 CT type: Split-core
 Inner diameter: 10mm/0.39"
 Amperage rating: 75A

2 Determining how many CTs to use

- 3-phase, 4-wire wye (with neutral) distribution panel feeds or individual loads require 3 CTs, one on each phase
- 3-phase, 3-wire delta (without neutral) distribution panel feeds or individual loads require 2 CTs, on each phase not connected to the eGauge's N terminal. See the eGauge configuration guide's delta system examples for wiring diagrams.
- Split-phase (phase-to-neutral) loads such as 120V residential outlets require a single CT
- Single-phase (phase-to-phase) loads such as 240V residential hot water heater require 2 CTs. If the measured load is purely single phase (no current on the neutral) such as many residential solar inverters, a single CT can be used. See configuration example **2.9 Appliances** in the configuration guide for more details
- Revenue-grade accuracy monitoring requires a high-accuracy CT on each phase of the equipment to be monitored. See section **5** for more information.

Some single-phase loads such as HVAC systems, dryers, and hot tubs are not balanced and will always require a CT on each phase. For example, a hot tub may have a 2-pole breaker, but use 240V for heating and 120V for lighting and pumps, which means current will be on the neutral. Facility main feeds and sub panel feeds are also not balanced.

eGauge offers these examples as a reference. The nature of the current on an appliance should be verified by a qualified electrician or via the appliance documentation before ordering.

3 Selecting the mechanical dimension of the CT

CTs are available in a number of different physical sizes. The inner diameter of the CT must be large enough to fit around the conductive wire you wish to monitor. The outer dimensions must be small enough to be installed inside the circuit panel or switch gear.

SKU:	Diameter:	Wire Size:
JD-SCT-010-XXX	10mm/0.39"	#14 to #2 AWG
JD-SCT-016-XXX	16mm/0.63"	1/0 to 3/0 AWG
JD-SCT-024-XXX	24mm/0.94"	4/0 AWG to 400 MCM
JD-SCT-036-XXX	36mm/1.42"	

Table 1: J&D CT model quick reference

Please see section [10.1](#) for full CT dimensions.

4 Selecting the current rating of the CT

CTs are available in a number of different amperage ratings between 10A to 4800A. The amperage of the conductor must not exceed the amperage rating of the CT, and the amperage rating of the CT should be as low as possible for highest accuracy. The eGauge will not measure currents greater than the amperage rating of the installed CT.

Standard J&D split-core CTs are stated to be within 1% accuracy while the measured amperage is between 1% and 100% of the CT amperage rating.

An easy way to select the amperage needed is to match the breaker or disconnect rating that you will be monitoring. For example, if you wish to monitor a 50A circuit, then a 50A CT would be appropriate. The CTs and eGauge will not be damaged if the amperage on the measured conductor exceeds the rating of the CT.

If the circuit or service is determined to have a maximum amperage that is well below the rated breaker amperage, you may choose a lower amperage CT.

Example: a typical residential service is rated for 200A with 2 phases feeding the home. Although the service is rated to have up to 200A on a single phase at any given moment, the reality may be that neither phase will pull over 100A ever. In this situation 2 100A CTs may be appropriate.

eGauge offers this examples as a reference. The nature of the current should be verified by a qualified electrician before ordering.

5 Revenue Grade CTs

High-accuracy split-core CTs are available. High accuracy CTs can be identified by a CT type code of ACT.

AccuCTs are available in 0.79" and 1.25". All AccuCTs have an error of .2% from 1% to 100% of their rated current.

AccuCTs can be paired with any eGauge main unit. For revenue grade readings, all conductors must be monitored, **including single-phase (phase-to-phase) balanced and unbalanced loads.**

For best accuracy, pair the AccuCT with an eGauge device with the 0.5% certificate report. The total system (eGauge meter and CTs) will have an error no greater than 0.5%. This pairing meets the ANSI C12.20 0.5% accuracy class.

Pair the Accu-CT with a non-certificate, 1.0% eGauge, and the result will be a system with no greater than a 1% error. This pairing meets the ANSI C12.1 accuracy class.

Some reporting agencies may require certified units, so it is important to determine if you will require a certificate with the unit. Certified units must be specified during ordering; a certificate cannot be generated for a unit once it is purchased from eGauge.

6 Rope CTs

Rope CTs (Rogowski coils) are excellent for bus-bars and large switch-gear applications. Self-powered rope CTs are flexible and easy to install with a fixed current rating. Rope CTs require a minimum amperage and are not for use in residential or low-current scenarios.

7 Direct Current CTs

DC (direct current) CTs are available for use with the eGauge to monitor DC amperage sources. These CTs must be modified by eGauge in order to function properly and require an external 12Vdc power source. A power supply for the CT is included.

Solid-core DC CTs have a .79" window. Power on the conductor to monitor must be disabled, disconnected, and then threaded through the CT window.

Split-core DC CTs have a 1.2" window. It is not necessary to disconnect the monitored conductor when adding the CT.

8 Extending CT leads

Split core CTs can be extended with 600V rated twisted pair wire to cover much longer distances. STP (shielded twisted pair) is recommended, as it will reduce noise and interference. If you need to extend a CT wire farther than approximately 100 ft, contact eGauge support to see if a custom scaling factor will be necessary in your software settings.

600V rated¹ cat 5 Ethernet cable can be used to extend up to 4 CTs.

9 Three-phase inverter notes

For PV inverters with three-phase outputs, 3 CTs are recommended. When inverters are not actively producing (in standby-mode, such as during the evening), they consume a small amount of power. Three-phase inverters have been seen not to consume the same amount on each phase during this mode, so using a single CT may cause anomalous behavior in the graph which can show as night-time generation or over-consumption.

Further, some brands of three-phase inverters don't produce on all 3 phases in some circumstances. In this case, a single CT would give erroneous readings and can be very inaccurate.

¹Required for safety listing.

10 Appendix

10.1 CT dimensions

10.1.1 JD-SCT-xxx-xxxx dimensions

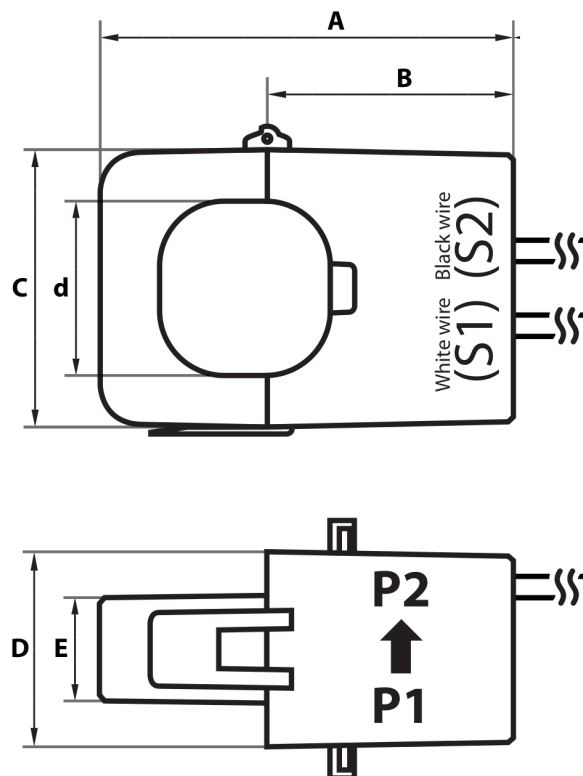


Figure 1: *JD-SCT-xxx-xxxx dimensions*

Part Number	A	B	C	D	E	∅ d
JD-SCT-010-xxxx	40.5mm 1.59"	23mm 0.91"	23.7mm 0.93"	26.6mm 1.05"	14.5mm 0.57"	10mm .39"
JD-SCT-016-xxxx	45mm 1.77"	26mm 1.02"	30mm 1.18"	31.6mm 1.24"	18.8mm 0.74"	16mm 0.63"
JD-SCT-024-xxxx	65mm 2.56"	37.5mm 1.48"	45mm 1.77"	33.7mm 1.33"	21.1mm 0.83"	24mm 0.94"
JD-SCT-036-xxxx	82.4mm 3.24"	48mm 1.89"	57.1mm 2.25"	40.2mm 1.58"	21.1mm 0.83"	36mm 1.42"

Table 2: *JD-SCT-xxx-xxxx dimensions*

10.1.2 AE-RCT-xxx-xxxx Dimensions

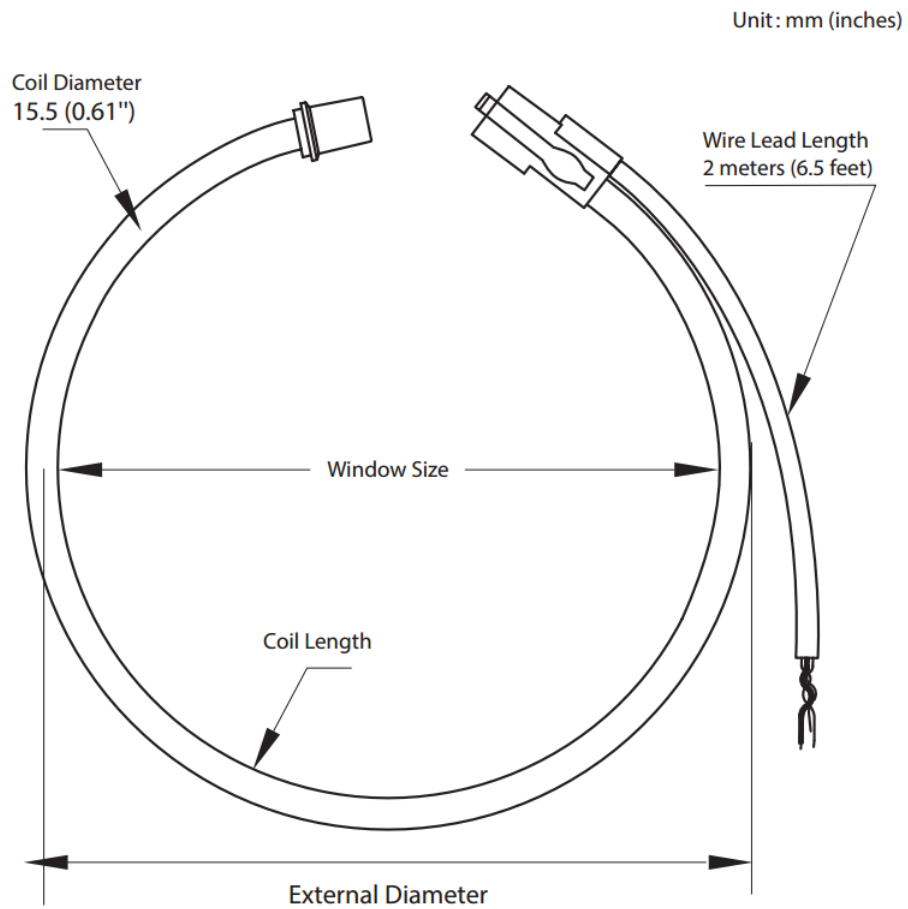


Figure 2: *AE-RCT-xxx-xxxx dimensions.*

Part Number	Window Size	Coil Length	External Diameter
AE-RCT-106-2775	106mm 4.17"	400mm 15.75"	143mm 5.63"

Table 3: *AE-RCT-xxx-xxxx dimensions*

10.1.3 JD-RCT-115-4085 (4.53" ID) dimensions

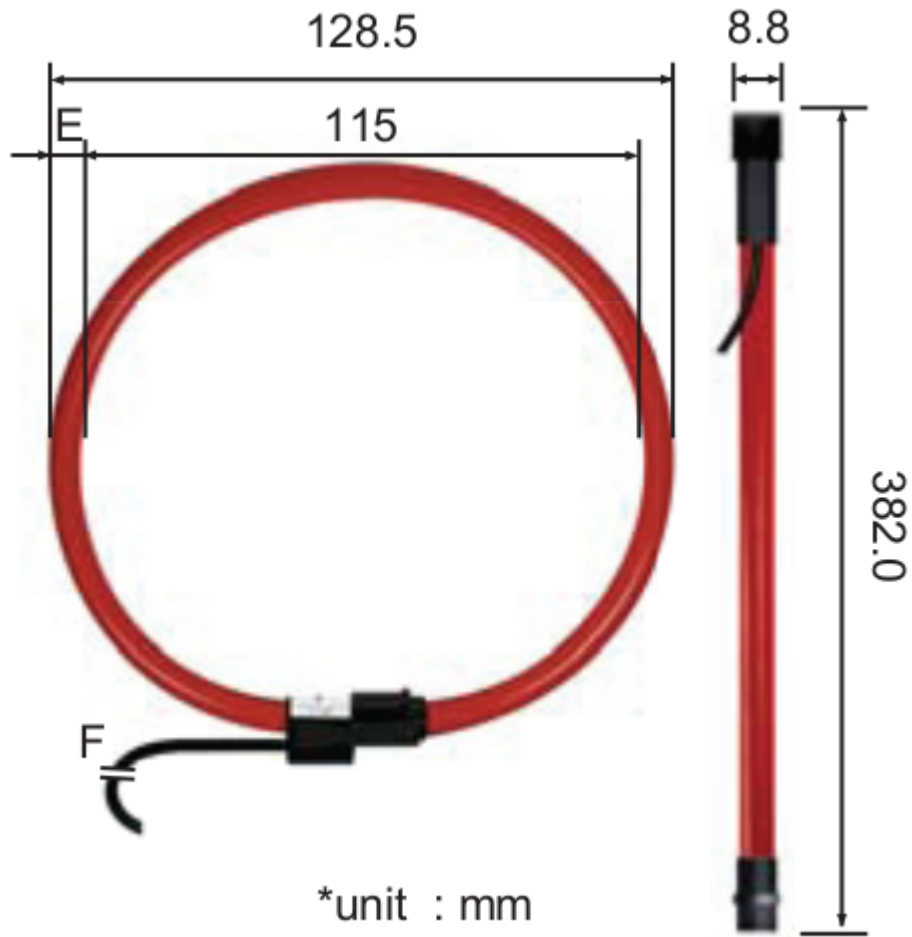


Figure 3: JD-RCT-115-4085 dimensions.

10.1.4 ML-RCT-150-4800 (6"ID) dimensions

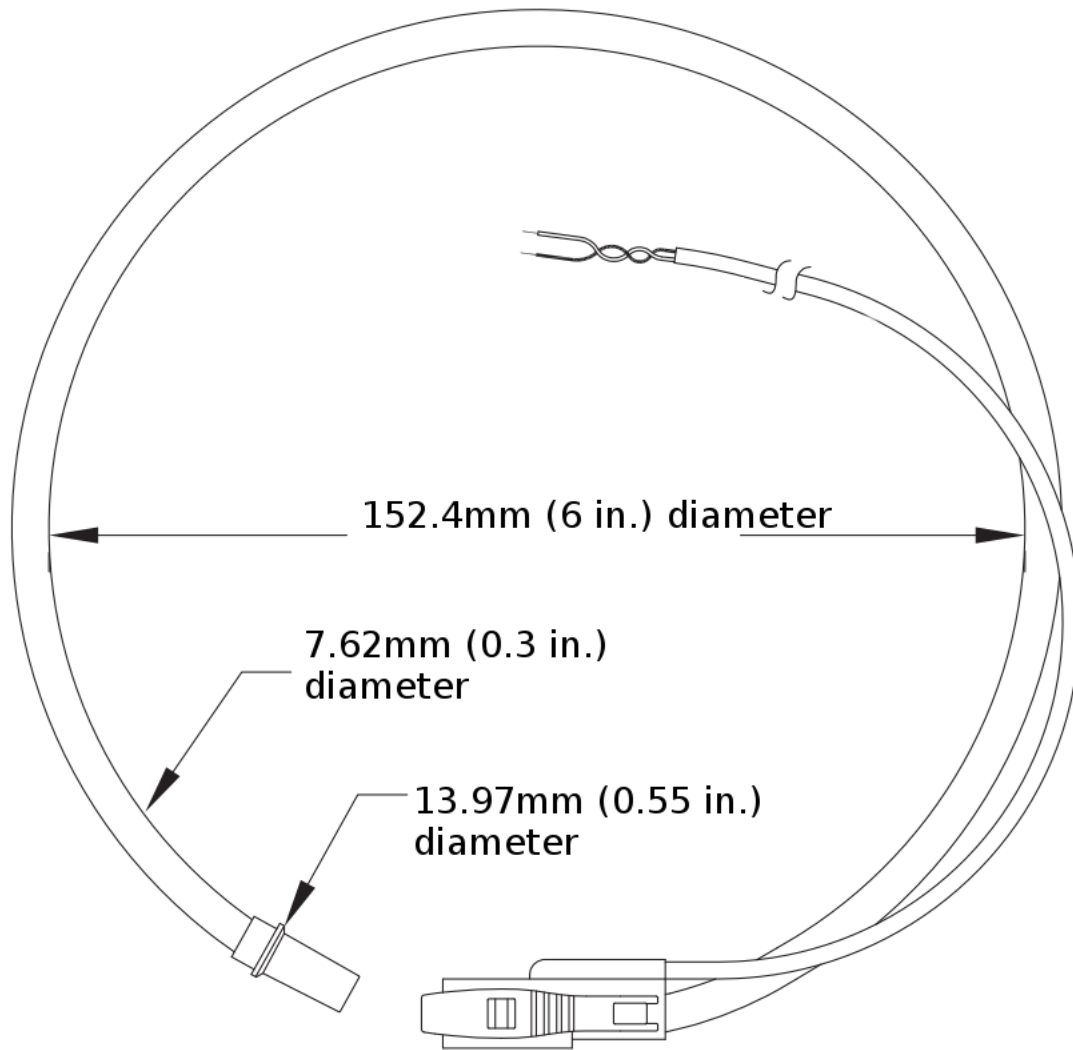


Figure 4: *ML-RCT-150-4800 dimensions.*

10.1.5 ML-SCT-010-xxx dimensions (0.4"ID)

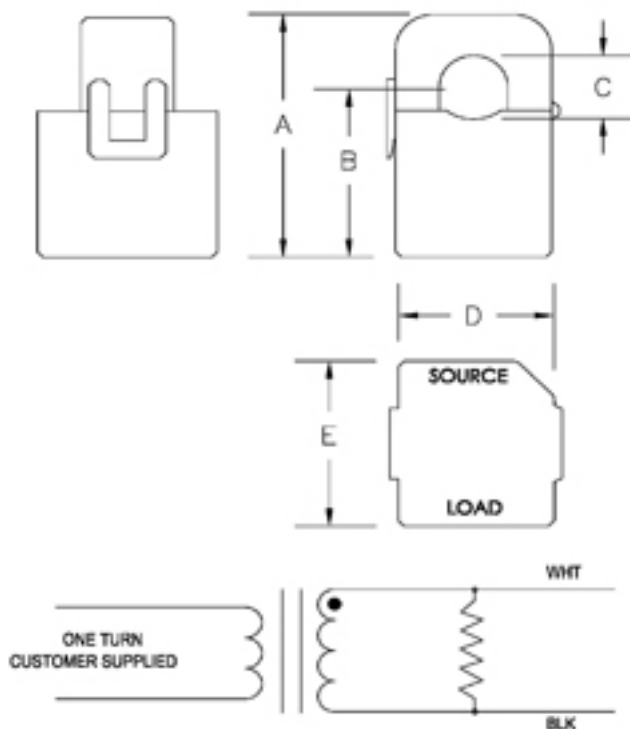


Figure 5: ML-SCT-010-xxx dimensions

Part Number	A	B	C	D	E
ML-SCT-010-xxx	1.56" 39.6mm	1.00" 25.4mm	0.40" 10.2mm	1.00" 25.4mm	1.05" 26.7mm

Table 4: ML-SCT-010-xxx dimensions

10.1.6 ML-SCT-019-xxx to ML-SCT-050-xxx (0.75" to 2.00" ID)

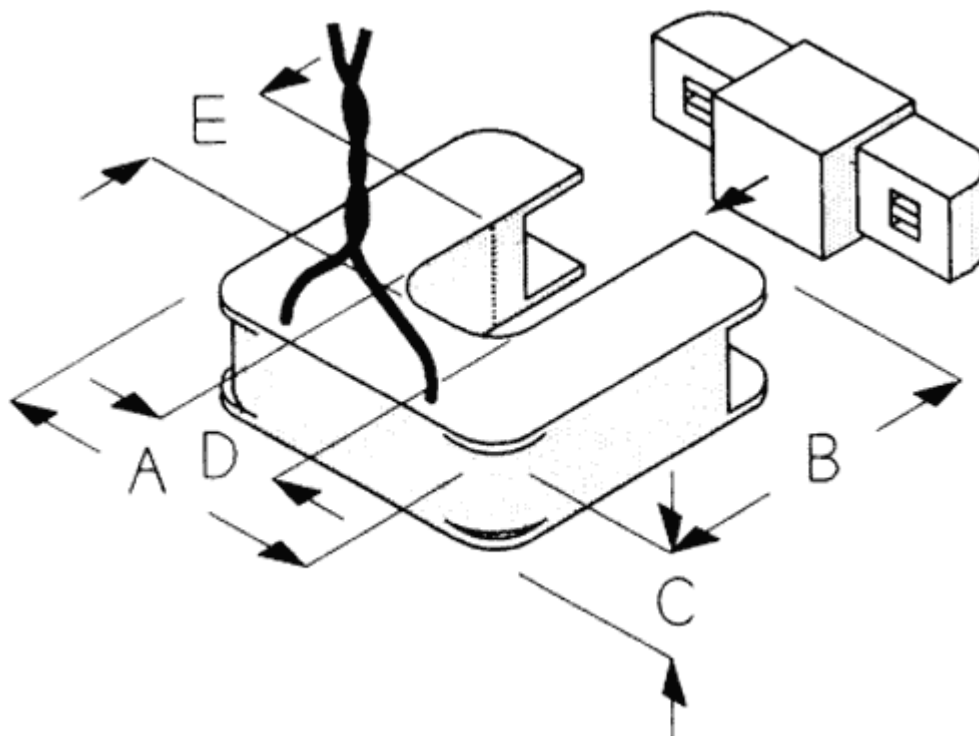


Figure 6: Magnelab CT dimensions between 0.75" and 2.00"

Part Number	A	B	C	D	E
ML-SCT-019-xxx	2.00" 50.8mm	2.10" 53.3mm	0.67" 17mm	0.75" 19.1mm	0.75" 19.1mm
ML-SCT-032-xxx	3.25" 82.6mm	3.35" 85.1mm	1.06" 26.9mm	1.25" 31.8mm	1.25" 31.8mm
ML-SCT-050-xxx	4.75" 120.7mm	5.00" 127mm	1.20" 30.5mm	2.00" 50.8mm	2.00" 50.8mm

Table 5: ML-SCT-019-xxx to ML-SCT-050-xxx dimensions

10.1.7 CC-ACT-020-xxxx dimensions (0.79" ID)

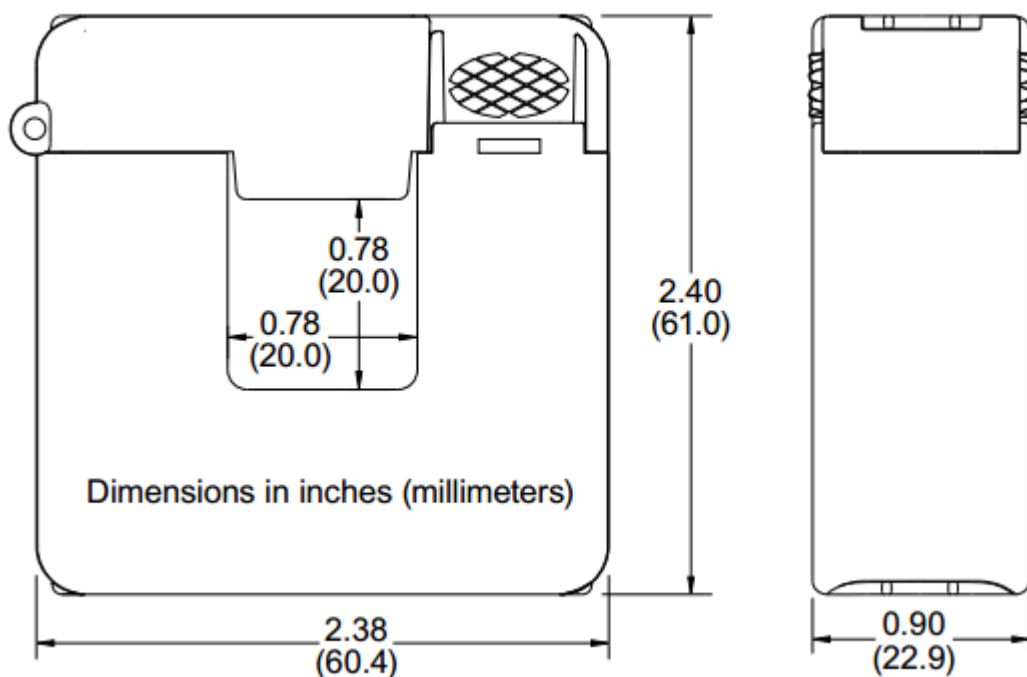


Figure 7: CC-ACT-020-xxxx dimensions. Note CTs are hinged, not fully-removable

10.1.8 CC-ACT-032-xxxx dimensions (1.25" ID)

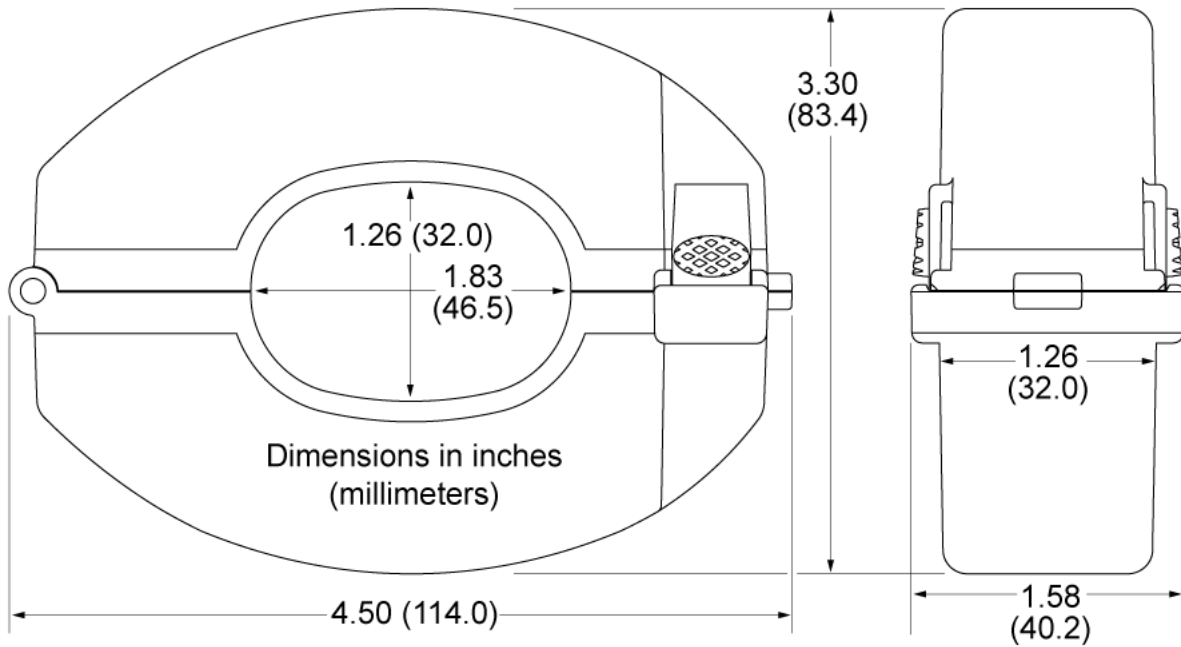


Figure 8: CC-ACT-032-xxxx dimensions. Note CTs are hinged, not fully-removable

10.1.9 CR-Dxx-xxxx dimensions (0.79" and 1.22" ID)

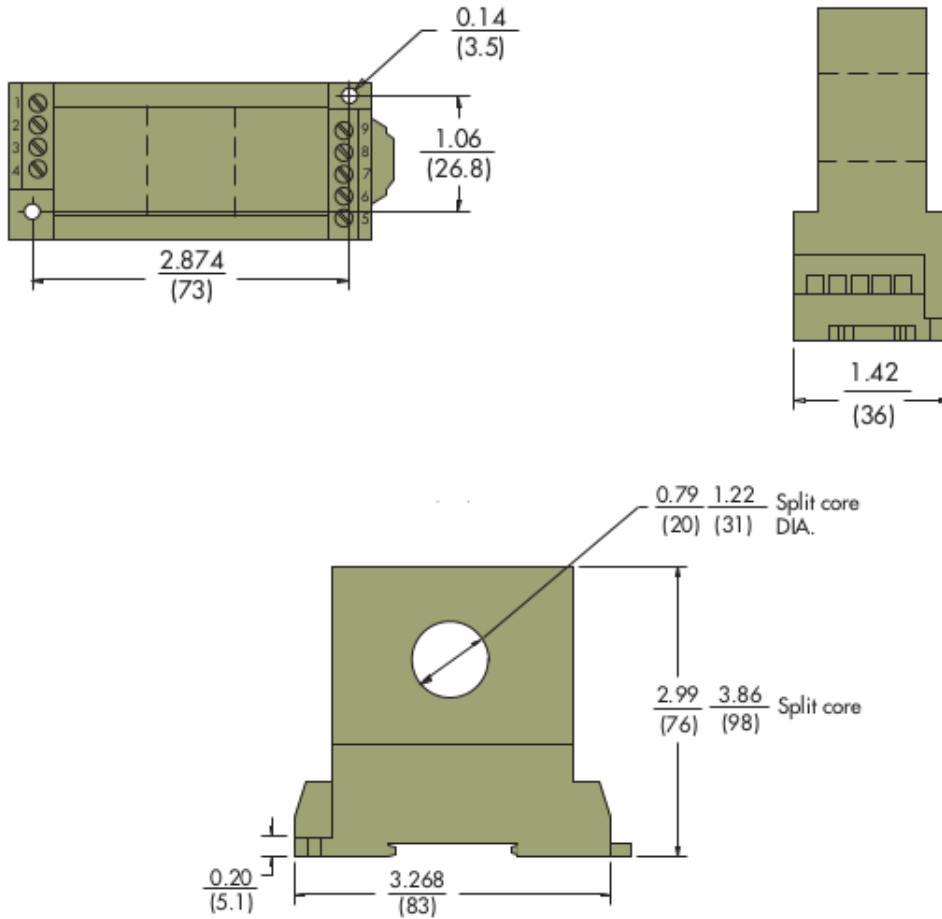


Figure 9: CR-Dxx-xxxx dimensions. Split-core DC CTs are hinged, not fully-removable

10.2 Full table of supported CTs

Note not all supported CTs are stocked, and must be custom ordered. Contact eGauge sales for lead times for CTs unavailable in the online store.

CT SKU (ID in inches):	Amperage rating (5A to 300A):													
	5	10	15	20	30	50	60	70	75	100	150	200	250	300
ML-SCT-010-xxxx (0.40")	✓	✓	✓	✓	✓	✓	✓		✓					
ML-SCT-019-xxxx (0.75")	✓	✓		✓	✓	✓		✓		✓	✓	✓		
ML-SCT-032-xxxx (1.25")						✓				✓	✓	✓	✓	✓
ML-SCT-050-xxxx (2.00")										✓		✓		✓
ML-SCT-076-xxxx (3.00")										✓				
JD-SCT-010-xxxx (0.39")	✓	✓		✓	✓	✓			✓					
JD-SCT-016-xxxx (0.63")						✓				✓				
JD-SCT-024-xxxx (0.94")					✓	✓				✓	✓	✓		
JD-SCT-036-xxxx (1.42")														✓
CC-ACT-020-xxxx (0.79")				✓		✓				✓		✓	✓	
CC-ACT-032-xxxx (1.26")													✓	
CR-DCT-020-xxxx (0.79")		✓		✓	✓	✓				✓	✓			✓
CR-DSC-020-xxxx (1.25")						✓				✓	✓			✓
JD-RCT-115-4085 (4.59")									Linear accuracy from 50A to 4085A →					
JD-RCT-190-4085 (7.48")									Linear accuracy from 50A to 4085A →					
ML-RCT-xxx-4800 ²									Linear accuracy from 50A to 4800A →					
AE-RCT-106-2775 ³									Linear accuracy from 30A to 2775A →					

CT SKU (ID in inches):	Amperage rating (400A to 4800A):									
	400	600	800	1000	1200	1500	2000	3000	4000	4800
ML-SCT-032-xxxx (1.25")	✓	✓	✓							
ML-SCT-050-xxxx (2.00")	✓	✓	✓	✓	✓	✓				
ML-SCT-076-xxxx (3.00")	✓	✓	✓	✓	✓	✓	✓	✓	✓	
JD-SCT-036-xxxx (1.42")	✓	✓								
CC-ACT-032-xxxx (1.26")	✓	✓								
JD-RCT-115-4085 (4.59")	Linear accuracy from 50A to 4085A →									
ML-RCT-xxx-4800 ³	Linear accuracy from 50A to 4800A →									
AE-RCT-106-2775 (4.59")	Linear accuracy from 30A to 2775A →									

³Note: ML-RCT-xxx-4800 are available in 150mm (6.00"), 200mm (8.00"), and 280mm (11.00")