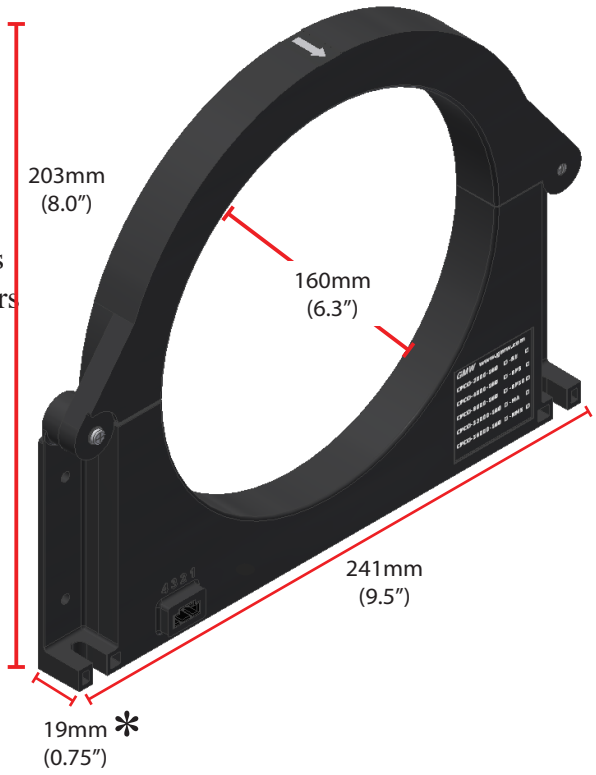
CPCO Series DC-AC Current Probe, Clamp On, 160mm, ±1000A ±2000A ±4000A ±8000A ±12000A, ±16000A

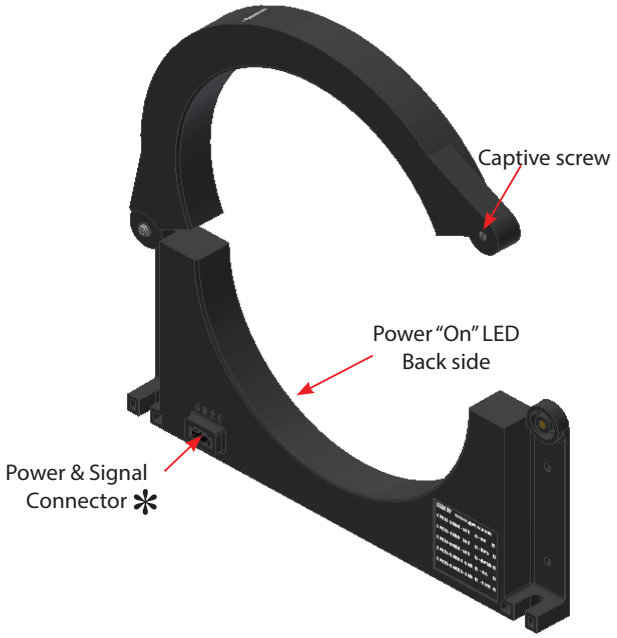
The CPCO Series (160mm aperture) Current Probes are Clamp On current sensors capable of measuring ac and dc currents. The Current Probe splits along a diameter allowing easy installation to existing cables without having to break the connection. A captive screw is used rather than a clip to ensure consistent closure under mechanical loading or vibration.

The Current Probes do not exhibit the magnetic hysteresis and non-linearity effects present in conventional open loop sensors with magnetic cores.



FEATURES

- Clamp On
- Operating Temperature:-40C to +85C
- Light Weight <300g (0.66 lb)
- Low Power <0.5W for Voltage Output Signal;
  <0.8W for 4-20mA Output Signal
- Operating Voltage: 11-31V single rail power supply
- Current Ranges: ±1000A ±2000A ±4000A ±8000A ±12000A, ±16000A
- Accuracy: +/-1%
- Wide bandwidth: dc to 50kHz (-3db).
- Output Signal Options: SE, BP5, BP10, MA, RMS and RMS-MA *(See below)*
- Power ON LED indicator
- Reverse power supply voltage protected
- High rejection of external magnetic fields, e.g. from external conductors or steel cabinet plates
- Output short circuit protection (except for 4-20mA version)
- Mating cables available, 1m and 10m (see page 5)



ORDERING INFORMATION

Part Number Format:

CPCO - *Current Range* - *Aperture* - *Output Signal Option*

CPCO = Current Probe Clamp On

Current Range

1000 = ± 1000A
2000 = ± 2000A
4000 = ± 4000A
8000 = ± 8000A
12000 = ± 12000A
16000 = ± 16000A

Aperture=160mm

Output Signal Option (max range)

SE = Single Ended, (5.0 ±5.0V)
BP5 = Bi-Polar, (0.0V±5.0V)
BP10 = Bi-Polar, (0.0V±10.0V)
MA = Current Source, (12mA±10mA)
RMS = RMS, (0.0V +4.0V)

e.g. **CPCO-8000-160-BP10**

✻ Current Probe Clamp On, ±8000A, 160mm Diameter Aperture, Bi Polar ±10V Output Signal

From December 1, 2017 the CPCO is updated to include : 4-pin rather than 3-pin Power & Signal Connector; axial thickness reduced to 19mm from 38mm; and additional Supply Voltage transient protection

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***GMW Associates*: 955 Industrial Road, San Carlos, CA 94070, USA. www.gmw.com. +1 (650) 802-8292**

TABLE 1: ELECTRICAL SPECIFICATIONS

Specifications by Current Range								
Specification		Symbol	CPCO-1000	CPCO-2000	CPCO-4000	CPCO-8000	CPCO-12000	CPCO-16000
Primary Current, Nominal		I_{PN}	±1000A	±2000A	±4000A	±8000A	±12000A	±16000A
Primary Current, Max		I_{PSAT}	±1250A	±2500A	±5000A	±10000A	±15000A	±20000A
Primary Current, Overload		I_{POL}	No Limit					
Sensitivity	SE Output	S	4.00mV/A	2.00mV/A	1.00mV/A	0.50mV/A	0.300mV/A	0.25mV/A
	BP5 Output		4.00mV/A	2.00mV/A	1.00mV/A	0.50mV/A	0.300mV/A	0.25mV/A
	BP10 Output		8.00mV/A	4.00mV/A	2.00mV/A	1.00mV/A	0.600mV/A	0.50mV/A
	RMS Output		4.00mV/Arms	2.00mV/Arms	1.00mV/Arms	0.50mV/Arms	0.30mV/Arms	0.25mV/Arms
	MA Output		0.008mA/A	0.004mA/A	0.002mA/A	0.001mA/A	0.0006mA/A	0.0005mA/A
	RMS-MA Output		0.016mA/A	0.008mA/A	0.004mA/A	0.002mA/A	0.0013mA/A	0.001mA/A
Sensitivity Accuracy		SA	±1 %					
Non Linearity		NL	< ±0.5% of FS					
Bandwidth (-3dB)		BW	dc to 50kHz					
Hysteresis after $\pm I_{PSAT}$		V_{HYS} or I_{HYS}	<0.5 % of FS	<0.5 % of FS	<0.5 % of FS	<0.5% of FS	<0.5 % of FS	<0.5 % of FS
Noise (3Hz to 1kHz)	SE Output	V_{NO}	<8mVrms	<8mVrms	<4mVrms	<2mVrms	<1mVrms	<1mVrms
	BP5 Output		<8mVrms	<8mVrms	<4mVrms	<2mVrms	<1mVrms	<1mVrms
	BP10 Output		<16mVrms	<16mVrms	<8mVrms	<4mVrm	<2mVrms	<2mVrms
	RMS Output		<4mVrms	<4mVrms	<2Vrms	<1mVrms	<0.5Vrms	<0.5Vrms
	MA Output	I_{NO}	8 µArms	8 µArms	4 µArms	2 µArms	1 µArms	1 µArms
Resolution			Noise / Sensitivity					
Dielectric Withstanding between Aperture ID and Connector Pins		U_W	>5000Vac (60Hz, Dwell Time 1min, <2ma)					

Specifications by Output Signal Type						
Specification	Symbol	SE (single ended)	BP5 (Bi Polar 5V)	BP10 (Bi Polar 10V)	RMS (RMS)	MA (4-20mA)
Output Signal, Nominal	V_{OUTN} or I_{OUTN}	5.0 ± 4.0V	0.0V ± 4.0V	0.0 ± 8.0V	0.0 to 4.0V	12 ± 8mA
Output Signal, Max	$V_{OUTMSAT}$ or $I_{OUTMSAT}$	5.0 ± 5.0V	0.0V ± 5.0V	0.0 ± 10.0V	0.0 to 5V	12 ± 10mA
Output Signal Current, Absolute Max	I_{OUTM}	2mA	±2mA	±2mA	2mA	22mA
Capacitive Load, Absolute Max	C_{OUTM}	10nF	10nF	10nF	10nF	10nF
Output Source Impedance	R_S	10 to 15Ω	10 to 15Ω	10 to 15Ω	10 to 15Ω	>100kΩ
Offset at I_p = 0, CPCO-1000	V_{OE} or I_{OE}	±30mV	±30mV	±50mV	0 to +20mV	±0.100mA
Offset at I_p = 0, CPCO-2000	V_{OE} or I_{OE}	±20mV	±20mV	±25mV	0 to +20mV	±0.050mA
Offset at I_p = 0 (Range >2000)	V_{OE} or I_{OE}	±5mV	±5mV	±10mV	0 to +20mV	±0.012mA
Maximum Response Time	t_R	<10µs	<10µs	<10µs	1s	<10µs
Power Supply Voltage	V_C	11 to 31V	11 to 31V	11 to 31V	11 to 31V	11-26V
Power Supply Current, Max	I_C	<80mA	<80mA	<80mA	<80mA	<80mA +I_{OUTN}

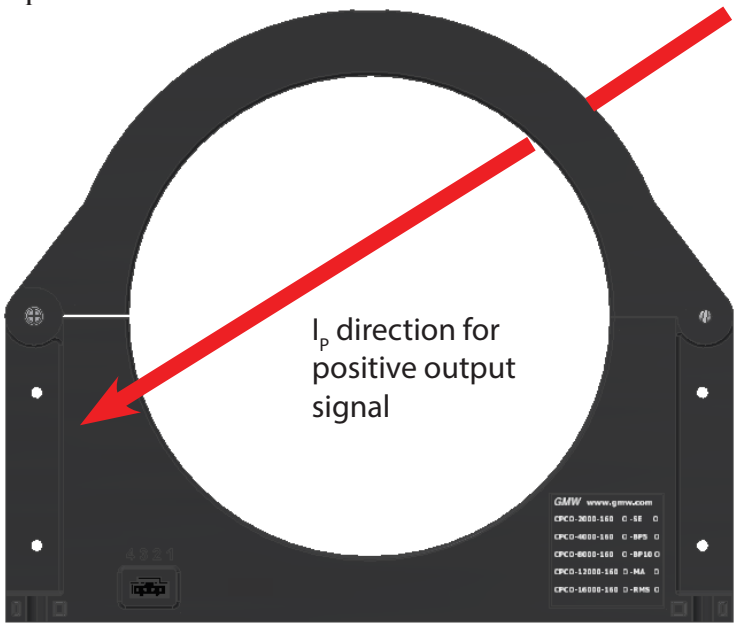
TABLE 2: MECHANICAL SPECIFICATIONS

Specification	
Aperture Diameter	160mm (6.3″)
Overall Size	203mm x 241mm x 19mm (8″ x 9.5″ x 0.75″)
Weight	300g (0.66lb)
Housing Material	Nylon 66 (UL 94 V-0)
Encapsulant Material	Polybutadiene Resin (UL 94 V-0)

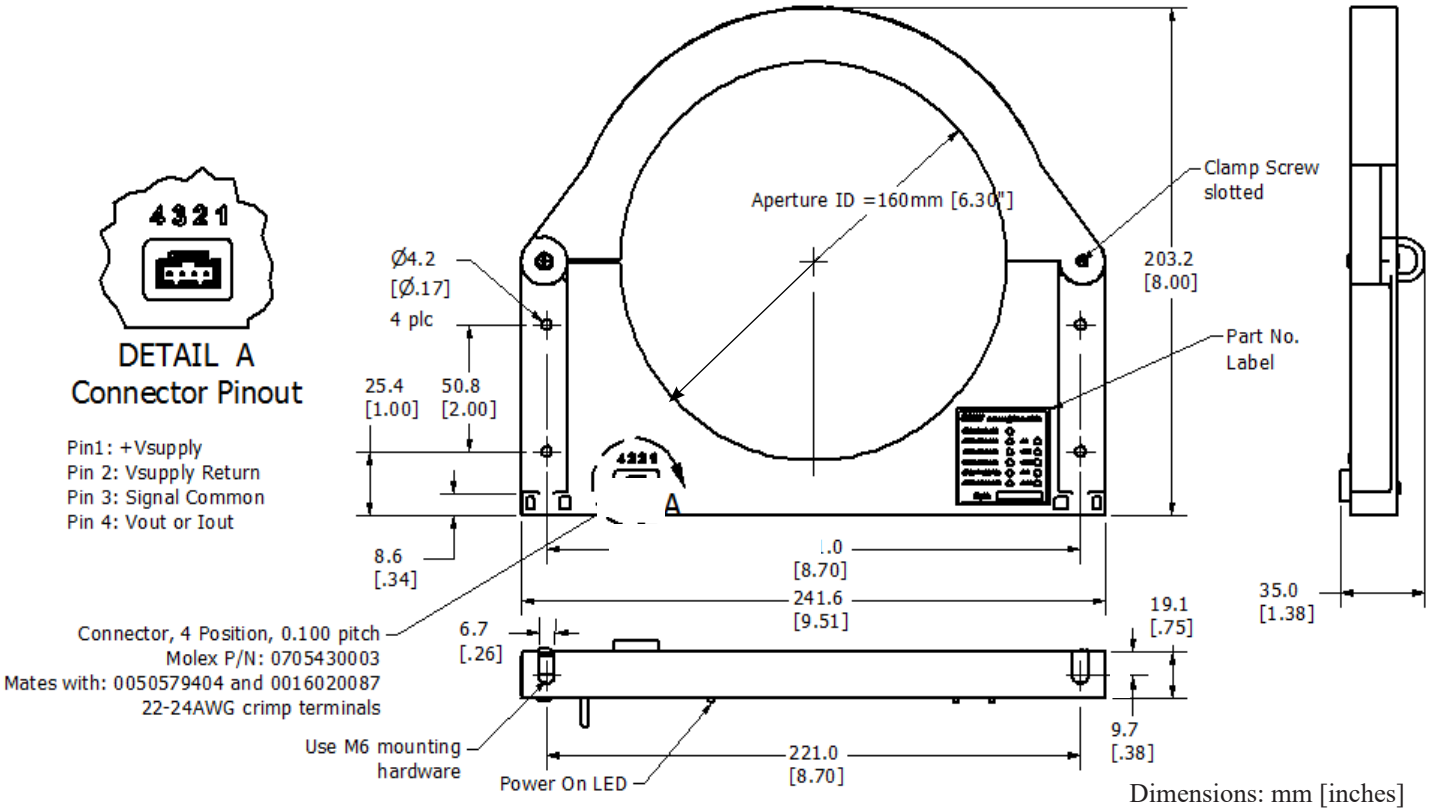
TABLE 2: ENVIRONMENTAL SPECIFICATIONS

Specification			
Temperature, Operating		-40 to 85C	
Temperature, Storage		-40 to 100C	
T_C of Sensitivity		± 200ppm/C	
T_C of Zero (referred to Ip)		± 0.8A/C	
Sealed		NEMA 5 equivalent	
Humidity, Operating		0-90% RH	
Humidity, Storage		20-60% RH	
External Magnetic Field Component, <0.2% of FS Output Signal Shift	In Plane	CPCO-1000	18mT (180G)
		CPCO-2000	33mT (330G)
		CPCO-4000	67mT (670G)
		CPCO-8000	133mT (1330G)
		CPCO-12000	200mT (2000G)
		CPCO-16000	267mT (2670G)
	Longitudinal or Axial	All Models	400mT (4000 G)
Effect of Primary Conductor Position within Aperture (20mm diameter conductor)		< 1.0% of FS	
Effect of Another Conductor within 5mm of any outer surface of probe (20mm diameter conductor, I ≤ to I_{PN})		<1.0% of FS	
Effect of Steel plate outside the Current Probe (200 x 200mm square plate)		In contact with any outer surface	< 1.0% of FS
		5mm from any outer surface	< 1.0% of FS

DRAWING 1: PIN AND I_P ORIENTATION



DRAWING 2: OUTLINE DRAWING



Dimensions: mm [inches]

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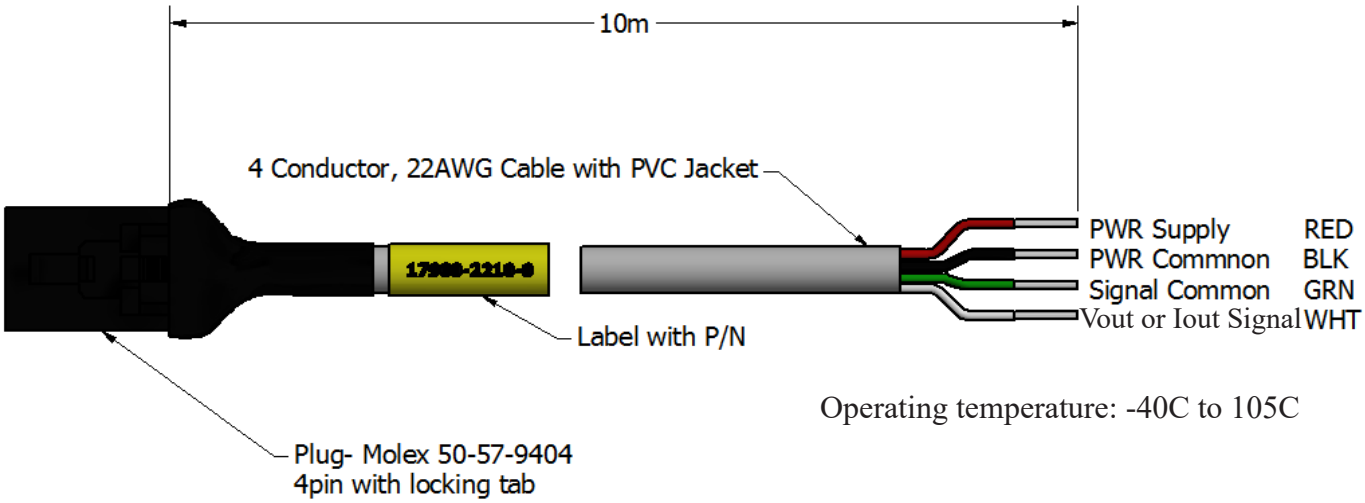
ACCESSORIES

Mating cables

17900-2210-0 **Cable, Pigtail, Signal and Power, 22AWG, 4pin Molex Plug, Locking tab and Unterminated, PVC Jacket,**



Operating temperature: -40C to 105C

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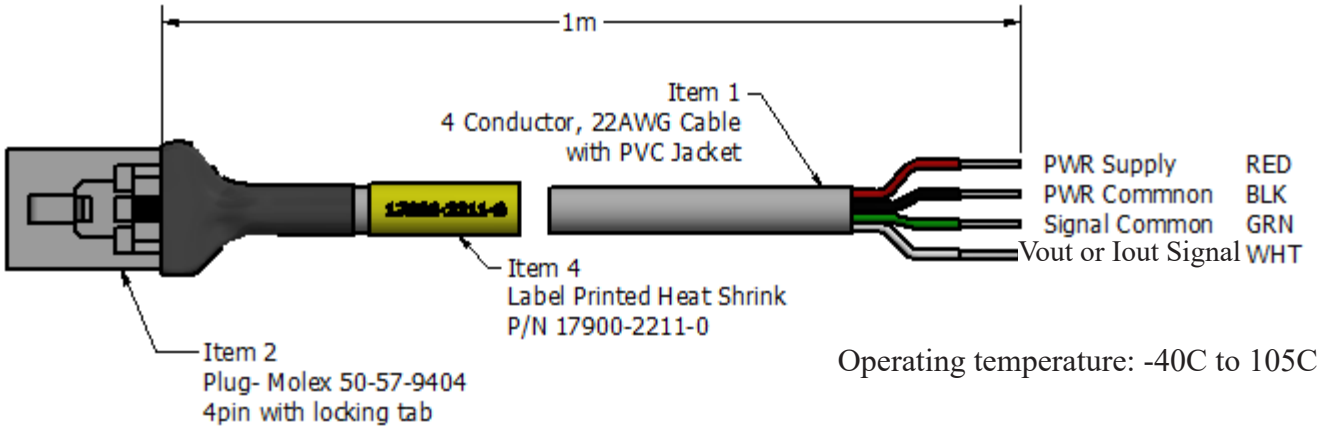
17900-2211-0 **Cable, Pigtail, Signal and Power, 22AWG, 4pin Molex Plug, Locking tab and Unterminated, PVC Jacket, 1m**



Operating temperature: -40C to 105C

****

17900-2213-0 **Connector and Pins, Set of 5 (Molex 50-57-9404 Housing, 16-02-0103 pins)**

5 ea

20 ea

Suggested hand crimping tool: Molex Part Number 0640160201

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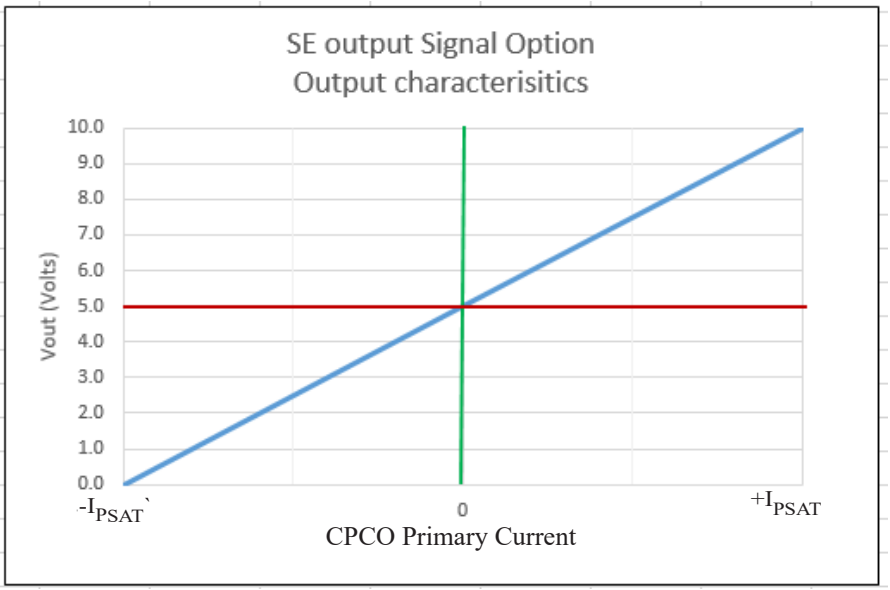
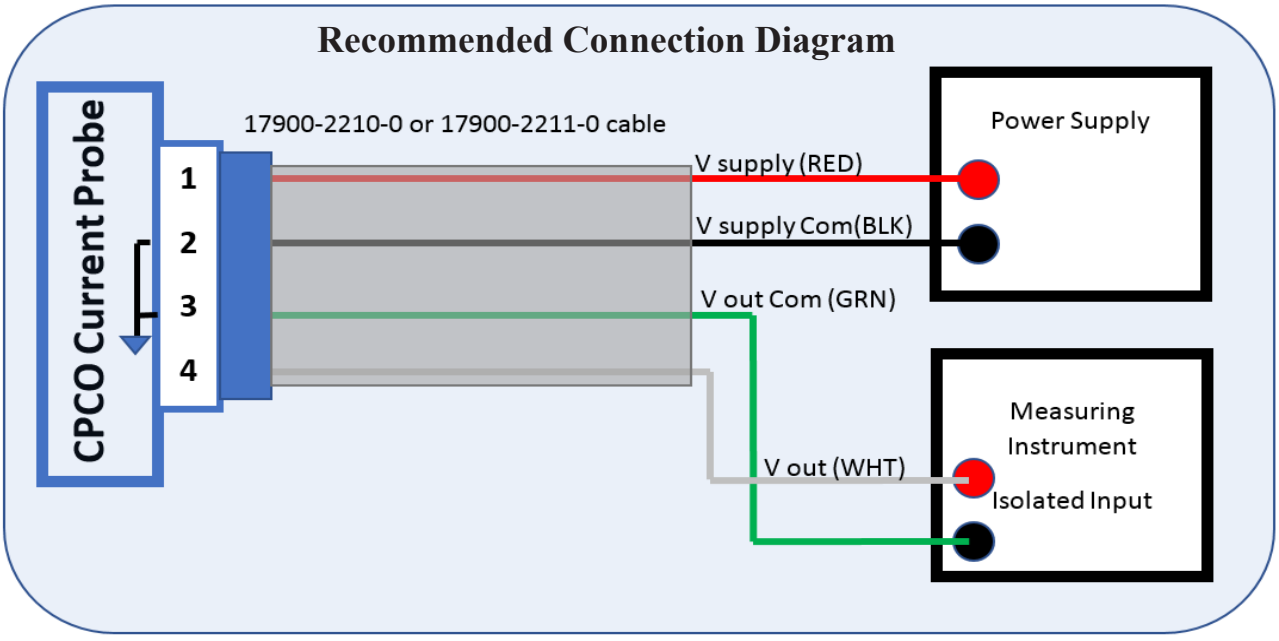
Signal Output Option Descriptions

SE Option - The SE stands for **S**ingle **E**nded and the output voltage from the CPCO will have a quiescent output voltage of 5.0V when there is no primary current (I_P=0A). As the primary current (Ip) increases in a positive direction, the output voltage will increase to the maximum level of 10.0V at I_P=+I_{PSAT}. When the primary current increases in the negative direction, the output voltage will decrease toward 0.0V at I_P=-I_{PSAT}. See below output characteristics.

This option is useful for applications that drive circuitry that can only accommodate positive signal inputs voltages such as inputs to A/D's





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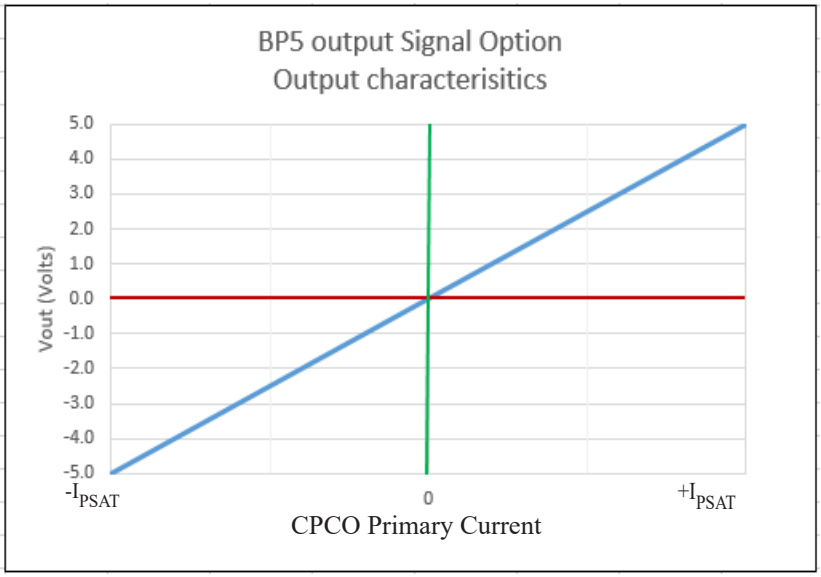
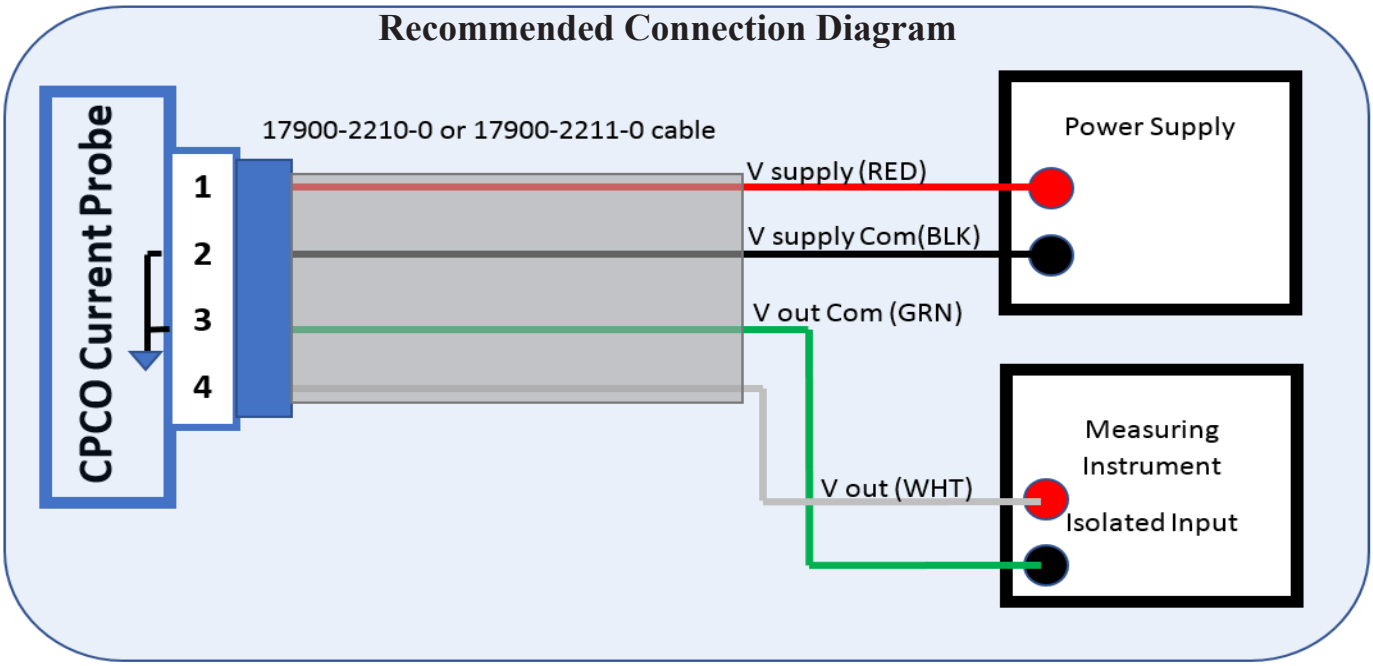
BP5 Option - The BP stands for Bi Polar and the output voltage from the CPCO will have a quiescent output voltage of 0.0V when there is no primary current (I_P=0A). As the primary current (I_P) increases in a positive direction, the output voltage will increase to the maximum level of 5.0V at I_P=+I_{PSAT}. When the primary current increases in the negative direction, the output voltage will decrease toward -5.0V at I_P= -I_{PSAT}. See below output characteristics.

This option is useful for applications that drive circuitry that can accommodate Bi Polar signal inputs that swing around Com (0.0V) such as oscilloscopes, data loggers. multi-meters, etc.



Recommended Connection Diagram



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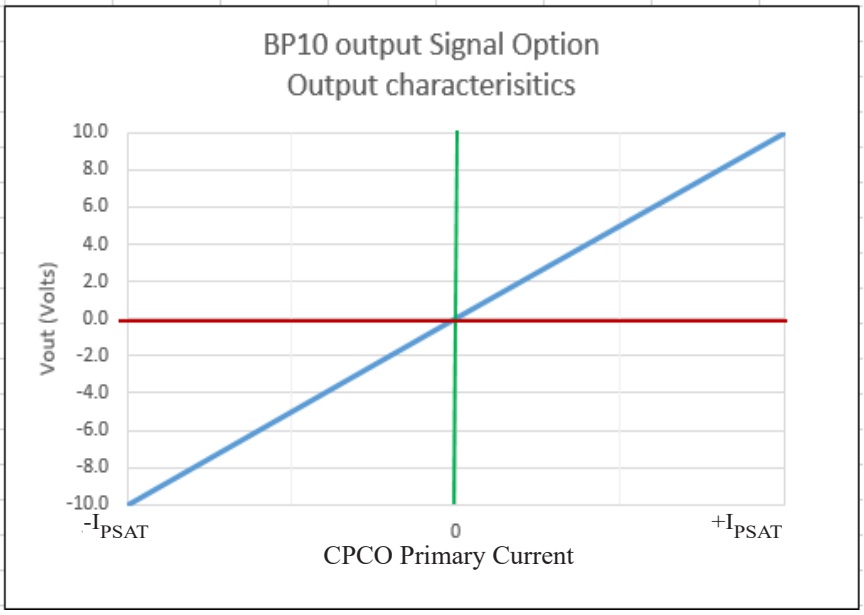
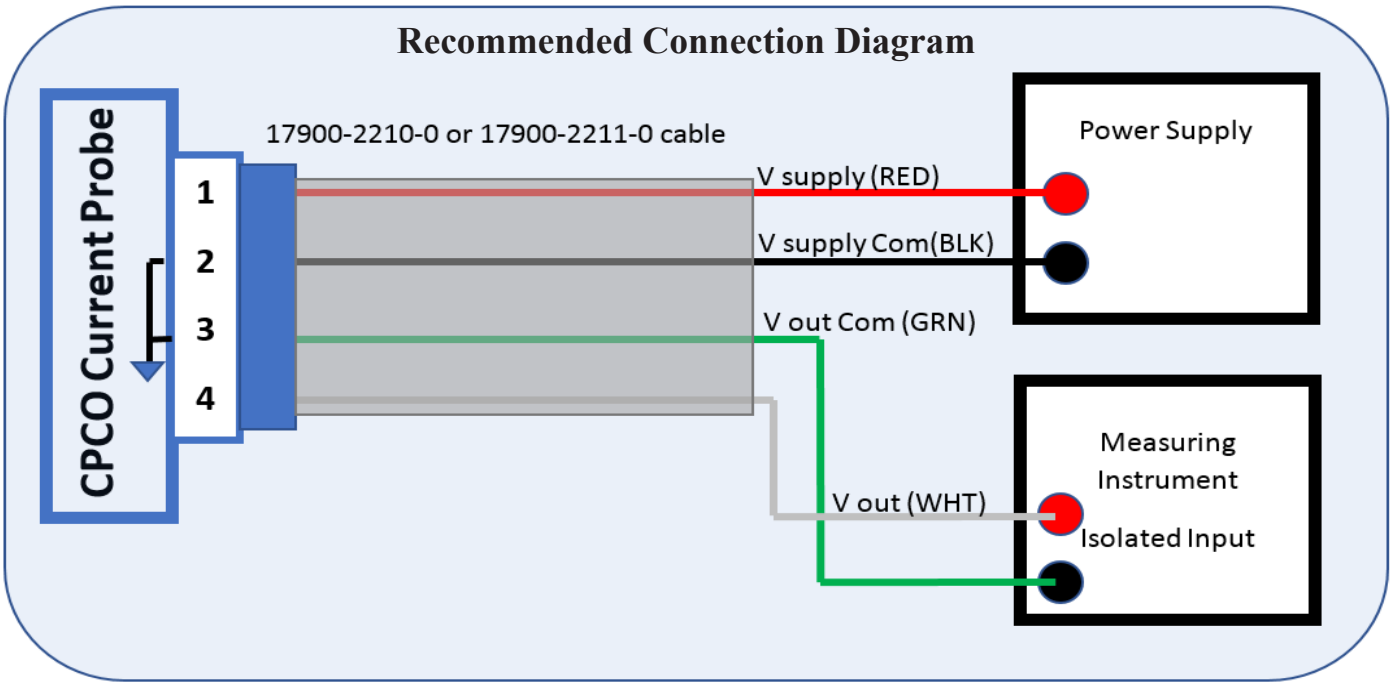
BP10 Option - The BP stands for Bi Polar and the output voltage from the CPCO will have a quiescent output voltage of 0.0V when there is no primary current (I_P=0A). As the primary current (I_P) increases in a positive direction, the output voltage will increase to the maximum level of 10.0V at I_P=+$I_{PSAT.}$ When the primary current increases in the negative direction, the output voltage will decrease toward -10.0V at I_P= -$I_{PSAT.}$ See below output characteristics.

This option is useful for applications that drive circuitry that need higher voltages and can accommodate Bi Polar signal inputs that swing around Com (0.0V) such as oscilloscopes, data loggers. multi-meters, etc.





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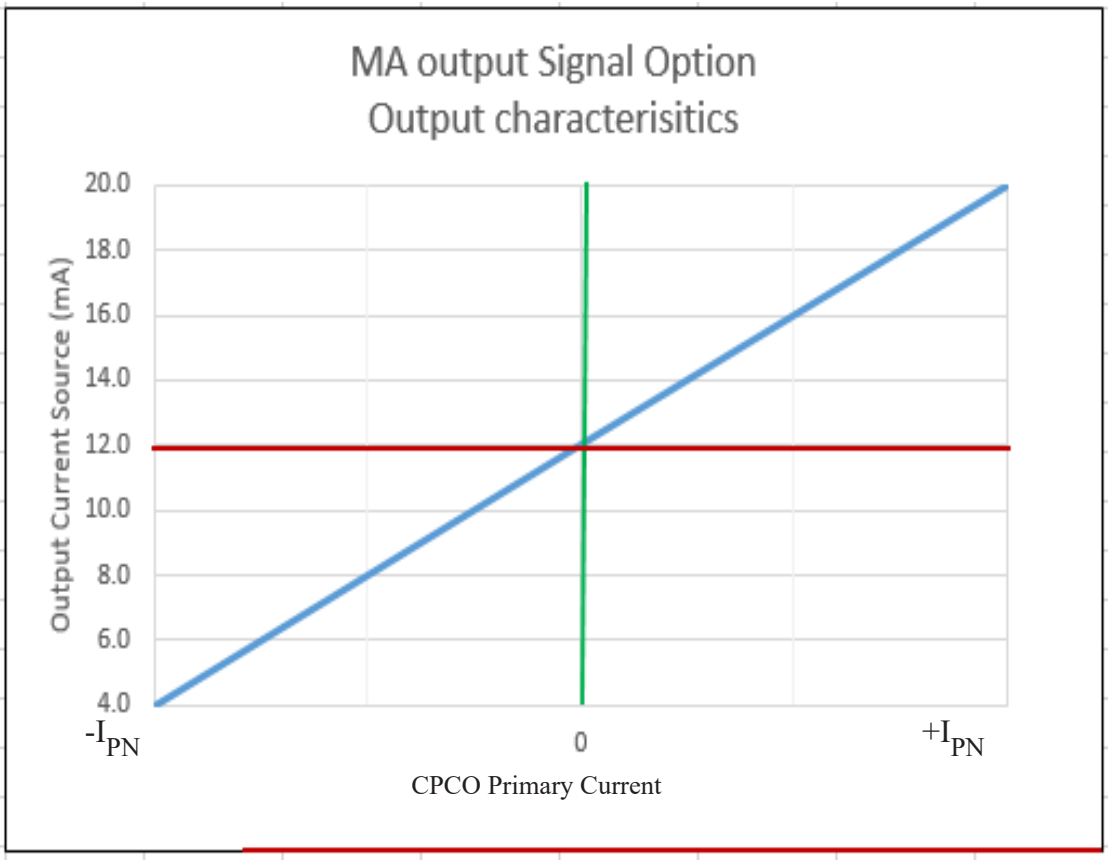
MA Option - The MA stands for **M**illi-**A**mp and the output from the CPCO will be a current source ranging from 4mA to 20mA. There is a quiescent output current source of 12mA when there is no primary current (I_P=0A). As the primary current (Ip) increases in a positive direction, the output current source will increase to the maximum level of 20.0mA at I_P=+$I_{PSAT.}$. When the primary current increases in the negative direction, the output current source will decrease toward 4mA at I_P=-$I_{PSAT.}$ The output current comes from the input power supply, therefore the CPCO power supply must be capable of providing the CPCO current of approx 50mA plus the output source current of up to 20mA. See below output characteristics.

This option is applicable to standard 4-20mA circuit configurations and optimum in noisy environments with long cable runs. The 4-20mA current source output is common with PLC's. Offset errors that can result from long cables are eliminated with the MA version.

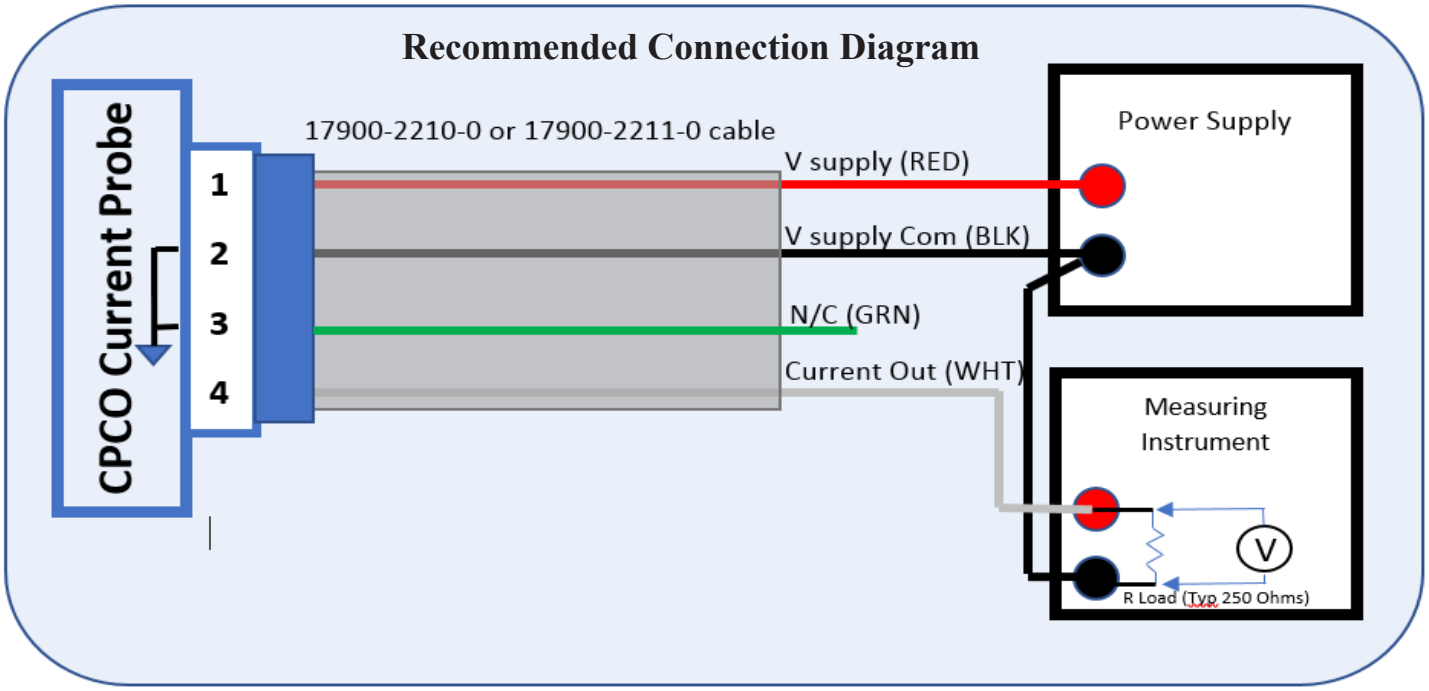


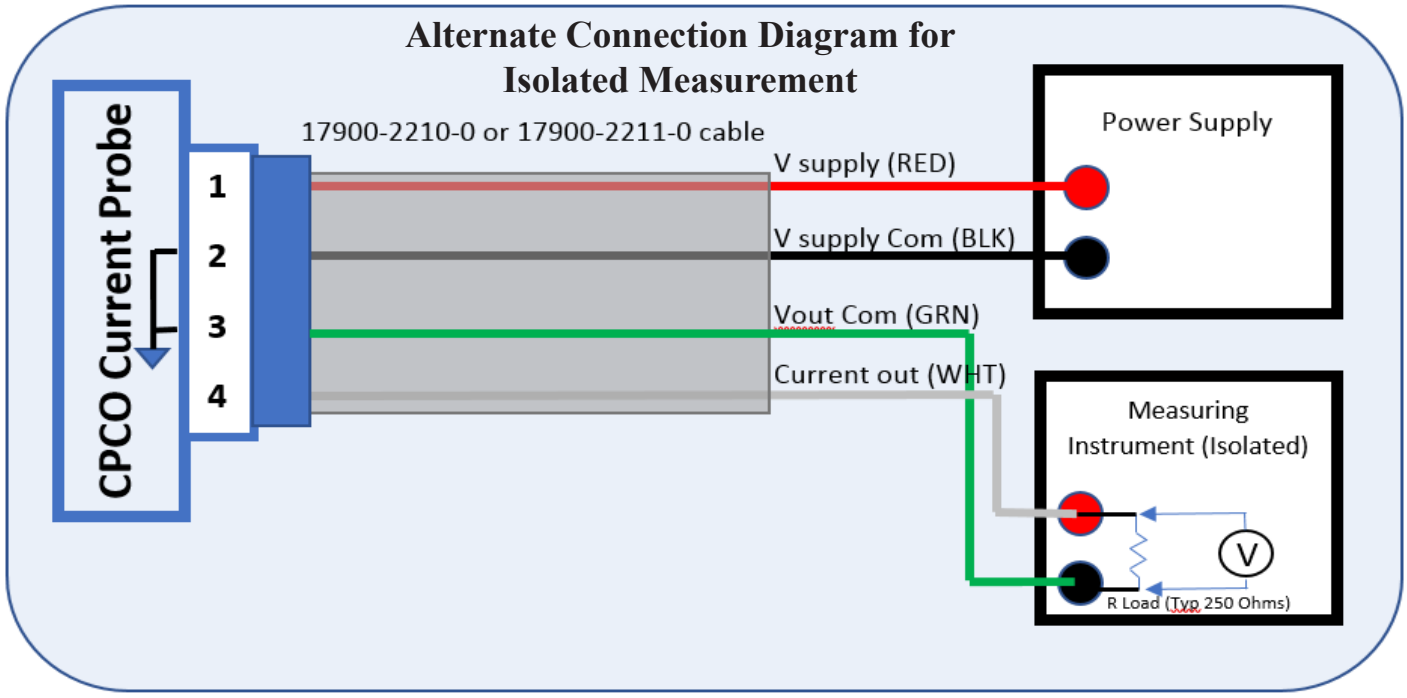
Typical MA option circuit diagram.

The 4-20mA current source flows from the PLC power supply, for example, to the CPCO and then back to the PLC, 4-20mA input. The typical PLC input load resistor is 250ohm.

With a 250 ohm resistor, the voltage across the resistor will be :

Vout=I source * R (example: at 12mA the Vout =3.00V)





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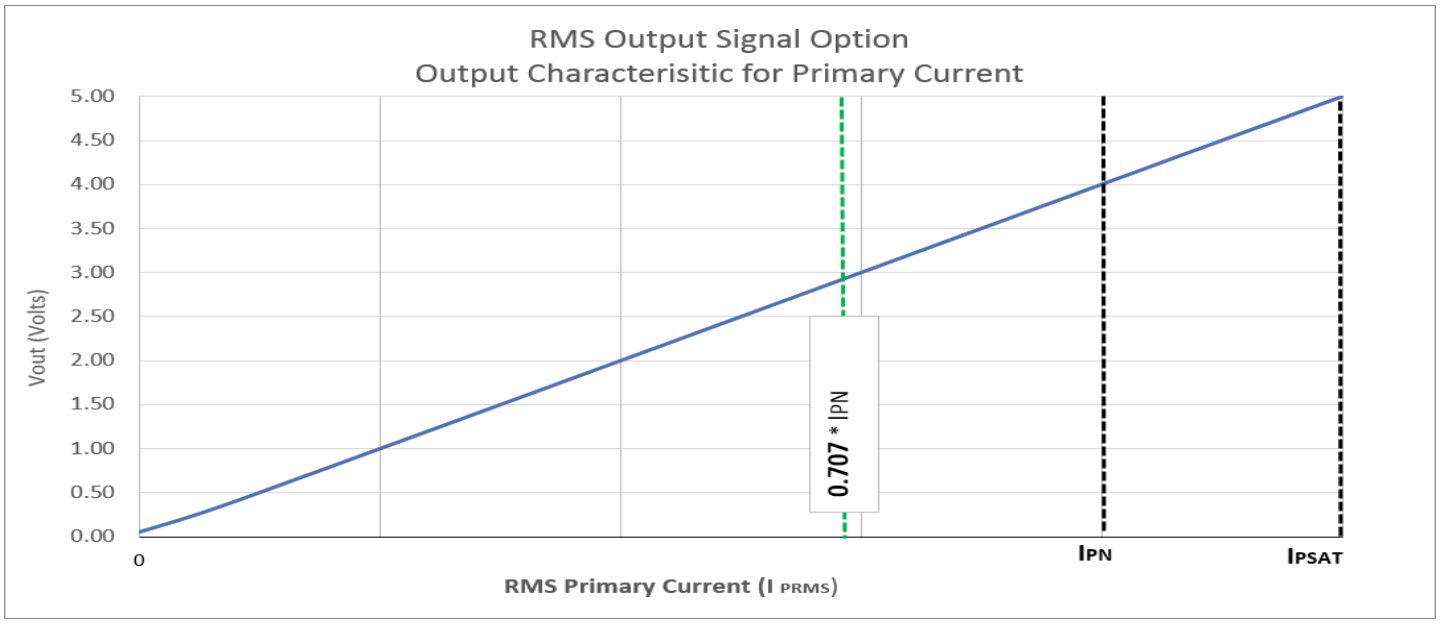
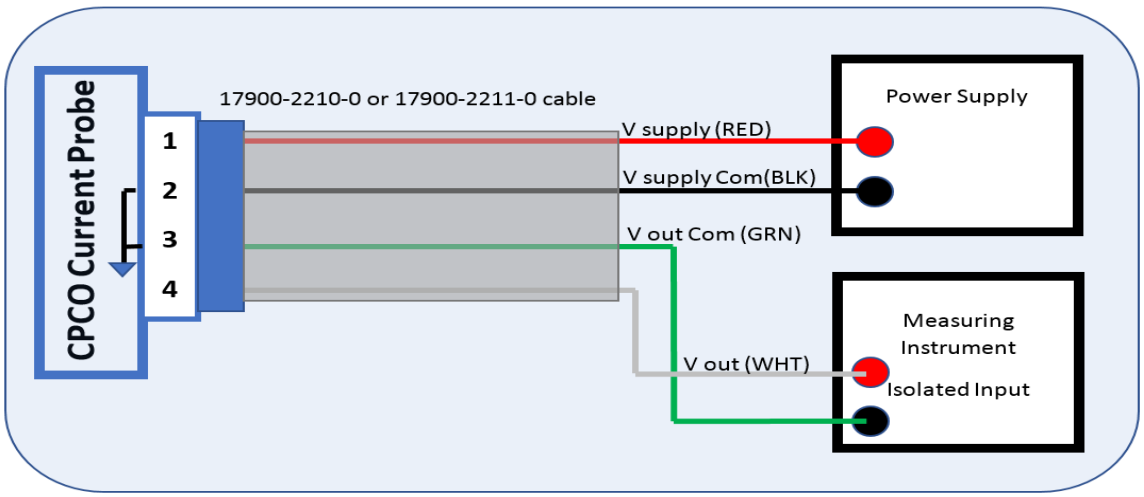
RMS Option - RMS stands for **R**oot **M**ean **S**quare and the output voltage from the CPCO has a quiescent output voltage in the range of 0.0V to 0.020V when there is no primary current (I_P=0A). The output is an analog voltage that is proportional to the RMS value of the primary current over the complete dc to 50kHz (-3dB) bandwidth of the primary current. See the output characteristic below.

Accurate RMS measurements of a time varying primary current require that the peak current never exceeds +/-I_{PN} to ensure that the CPCO is operating within the linear electronic range to avoid limiting of the CPCO signal. For a sine wave primary current, I_{PRMS} is 0.707 * I_{PN}. This implies that the maximum RMS primary sine current should be < 0.707 I_{PN} for the highest accuracy RMS output signal. For primary currents with occasional high current transients it is essential that the transients do not exceed I_{PSAT}. For this type of primary current waveform, the maximum allowed RMS current may be much less than 0.707 I_{PN}.





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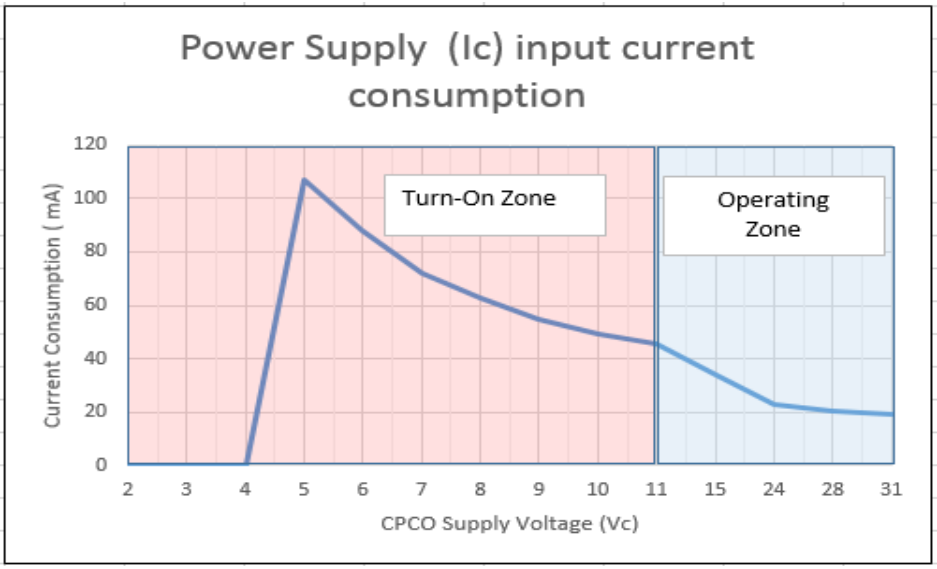
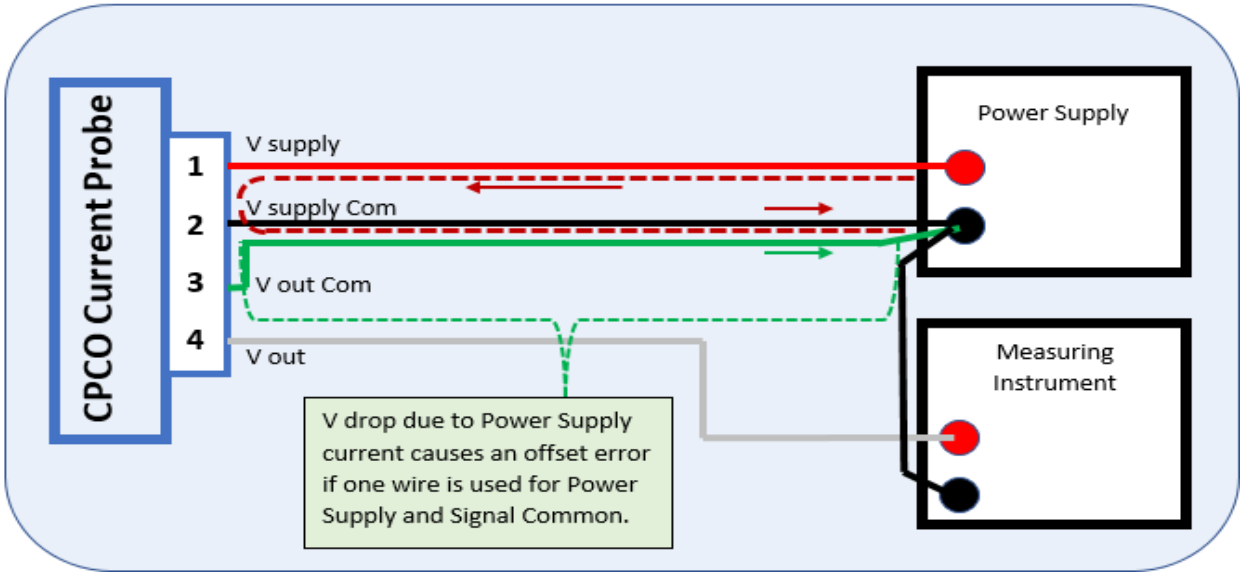
Power Supply (Vs)

The CPCO incorporates a switching power supply to convert the input power to the internal low voltage operating voltages and reduce the internal power dissipation. The power consumption is relatively constant, therefore the input current is inversely proportional to supply voltage, Vs. The max current is specified to be 47mA once the input voltage reaches the normal operating range of 11-31V, however during the turn-on the current required is higher . See the below graph for the power current required. The power supply used to operate the CPCO, must have at least 150mA capability otherwise the CPCO will not turn on.



Offset error caused by connecting the common returns together

It is recommended the Vout Common and V supply return be isolated from each other to avoid Offset error in the measurement of Vout. The CPCO will work if the returns are tied together, however the Offset voltage at the measuring instrument will change due to the voltage drop caused by the supply current and resistance of the wire. See diagram below:



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Revision Status:

3-MAR-2021. Page 2. Changed Sensitivity Accuracy from “±1 % of Sensitivity specification” to “+/-1% “.