



PROTECTION & RELIABILITY INSTRUMENTS

Wiring

CONNECTING & POWERING LOOP POWER SENSORS



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4-20 mA Loop Power Sensors

Process control provides a wide variety of monitoring options, time-based trending, and control applications to keep machines performing efficiently and running at their required capabilities. 4-20 mA current loops are inherently low in noise, and signals can be transmitted over long distances making an ideal combination for industrial applications. Loop Power Sensor outputs are proportional to current with 4 mA representing a zero level, and 20 mA representing a maximum level over a given range. Basically, they regulate the current flowing in the loop and have 4-20 mA outputs proportional to acceleration or velocity. As the vibration of the machine increases, the current output from the sensor increase. Adding a Loop Power Sensor to the machine provides a critical measure of the machine's health, and can be used to identify changes in balance, alignment, gears, bearings, and many other potential faults that may not be currently detected. Monitoring machine vibrations can prevent undetected catastrophic failures from occurring, and at the same time, require minimal human interaction to provide continuous machine protection.

Loop Power Sensors are a two-wire technology where Pin A is positive, and Pin B is negative. Please reference Figure #1. Typical loop power sensors are the:

- 4-20 mA proportional to Velocity = LP202 series, LP204 series, LP252 series, LP254 series, LP285 series, and LP 284 series
- 4-20 mA proportional to Acceleration = LP302 series, LP304 series, LP352 series, and LP354 series

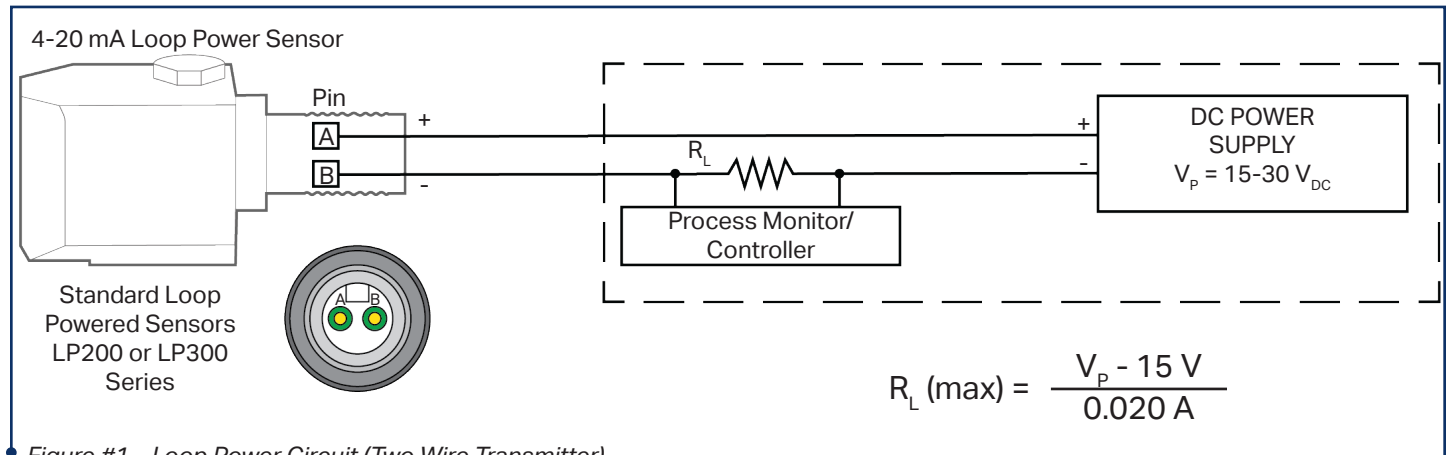


Figure #1 – Loop Power Circuit (Two Wire Transmitter)

4-20 mA Loop Power Vibration Sensors

Relative to Figure #1, for a two-wire Loop Power Sensor, the positive wire would be connected to Pin A, and the negative wire would be connected to Pin B. The measurement device (R_L) will be placed in series with the negative wire between the Loop Power Sensor and the negative terminal of the power supply. In this configuration, the Process Monitor or Controller can measure the 4-20 mA current flowing in the current loop.

In many cases, R_L will be a 250 Ω resistor. In this scenario, Ohm's Law ($E=IR$) will provide:

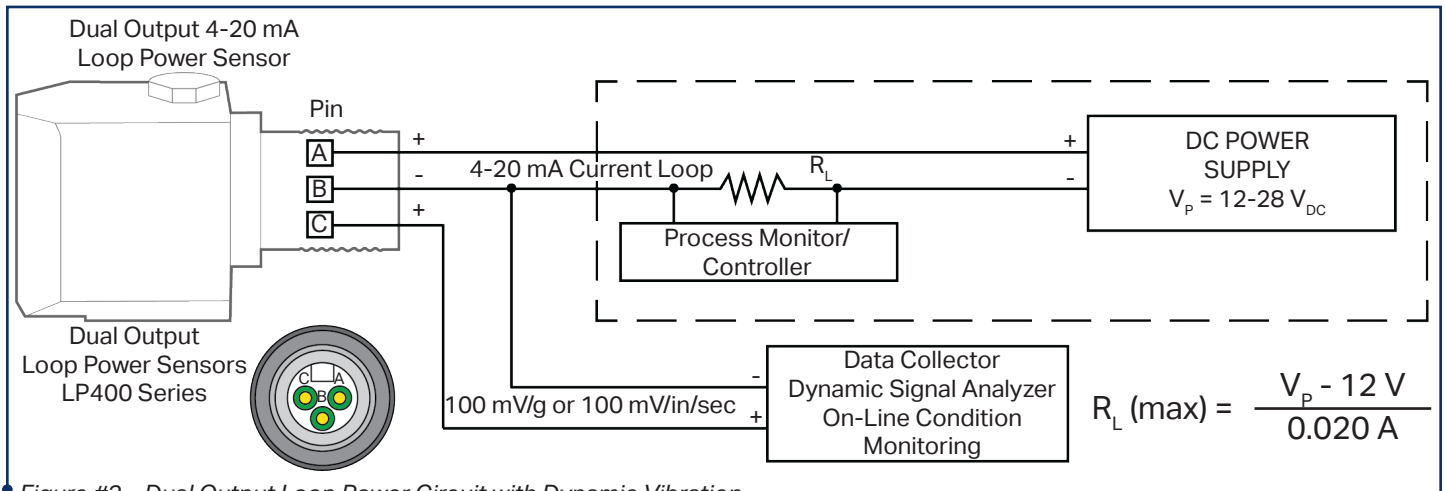
- a zero value of 1 V_{DC}
($E = 0.004 \text{ A} \times 250 \Omega$)
- a maximum value of 5 V_{DC}
($E = 0.020 \text{ A} \times 250 \Omega$)
- When $R_L = 250 \Omega$, and $V_p \leq 24 V_{DC}$
then R_L should be $\frac{1}{2} \text{ W}$
- When $R_L = 250 \Omega$, and $24V_{DC} < V_p \leq 30 V_{DC}$
then R_L should be 1 W

Dual Output 4-20 mA Loop Power Sensors

Dual output loop power sensors also provide a secondary output of dynamic vibration. These secondary outputs could be acceleration or velocity and are combined in three different loop power sensor configurations:

1. LP401 Series - Overall Velocity (4-20 mA), and Dynamic Velocity (100 mV/in./sec)
2. LP402 Series - Overall Velocity (4-20 mA), and Dynamic Acceleration (100 mV/g)
3. LP404 Series - Overall Acceleration (4-20 mA), and Dynamic Acceleration (100 mV/g)

Dual Output 4-20 mA Loop Power Sensors are a three-wire technology where Pin A is the positive 4-20 mA power, Pin B is a shared common, and Pin C is a positive dynamic vibration. Please reference Figure #2.



• Figure #2 – Dual Output Loop Power Circuit with Dynamic Vibration

Dual Output 4-20 mA Loop Power Vibration Sensors with Additional Dynamic Vibration Output

Relative to Figure #2, for a three-wire Dual Output Loop Power Sensor that includes a dynamic vibration output, the positive 4-20 mA wire would be connected to Pin A, the negative wire would be a shared common connected to Pin B, and the positive Dynamic Vibration would be connected to Pin C. The 4-20 mA measurement device (R_L) will be placed in series with the negative wire between the Loop Power Sensor and the negative terminal of the power supply. In this configuration, the Process Monitor or Controller can measure the 4-20 mA current flowing in the current loop. The Data Collector, Dynamic Signal Analyzer, or On-line Monitoring System will measure the Dynamic Vibration (100 mV/g or 100 mV/in./sec) across Pin C (+) and Pin B (-). **The 4-20 mA loop power provides all the power for the sensor, including the Dynamic Vibration.**

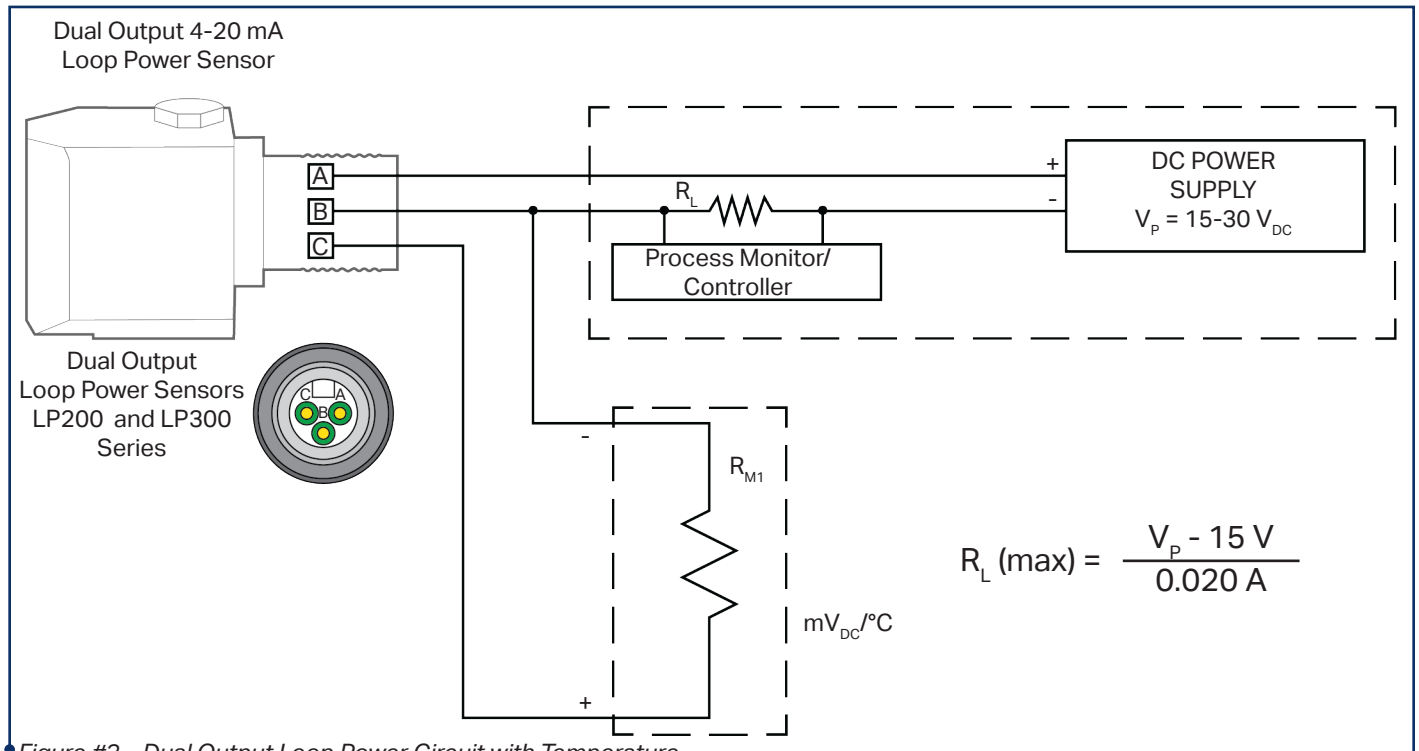
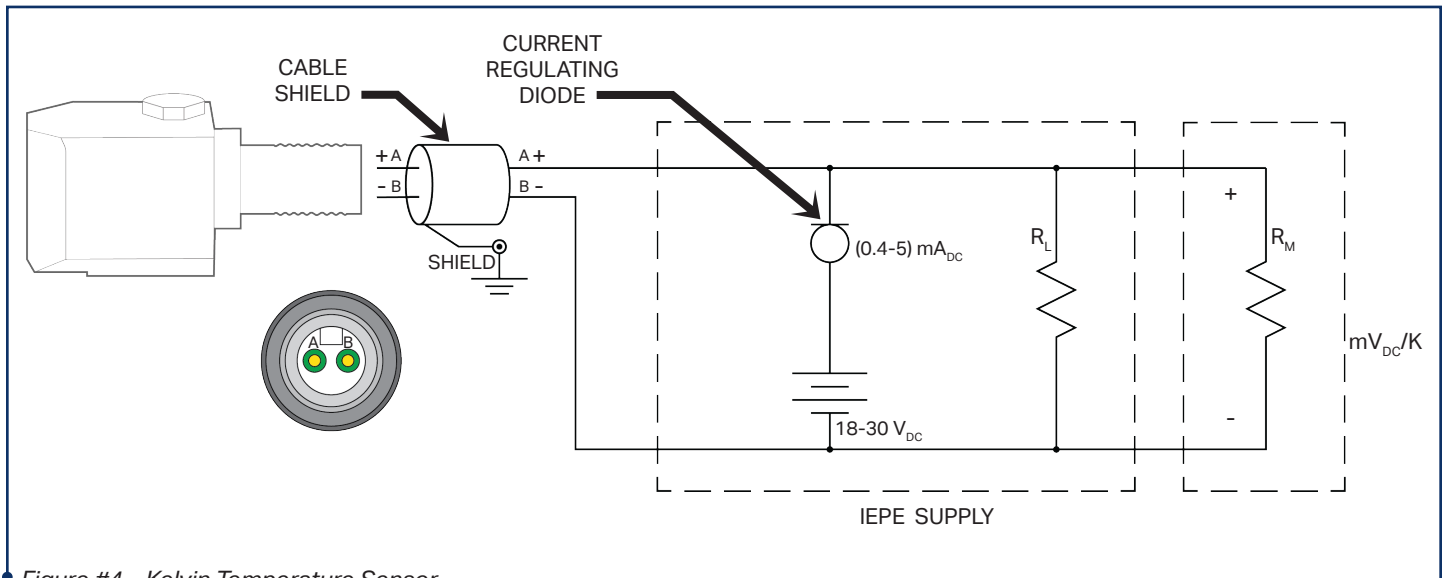


Figure #3 – Dual Output Loop Power Circuit with Temperature

Dual Output 4-20 mA Loop Power Vibration Sensors with Additional Temperature Sensor Output

The wiring diagram in Figure #3 illustrates the connections for a dual output 4-20 mA loop power sensor that includes a temperature measurement with a sensitivity of 10 mV_{DC}/°C. The LP232 series and LP234 series would be available with a 4-20 mA output proportional to velocity, and the LP332 series and LP334 series would be available with a 4-20 mA output proportional to acceleration. The positive 4-20 mA wire should be connected to Pin A, the negative wire would be a shared common connected to Pin B, and the positive output temperature measurement will be on Pin C. Please remember that the 4-20 mA circuit will provide power for the sensor, and the temperature output will be in DC volts with a sensitivity of 10 mV_{DC}/°C.



• Figure #4 – Kelvin Temperature Sensor

Kelvin 10 mV_{DC}/K Temperature Sensors

The wiring diagram in Figure #4 illustrates the connections for a Kelvin temperature sensor that provides a temperature measurement with a sensitivity of 10 mV_{DC}/K. The TK120 series (top exit) and TK124 series (side exit) sensors provide industrial-strength temperature measurements by incorporating a 316L stainless steel case with a 2 pin MIL 5015 C hermetic connector. The positive wire should be connected to Pin A, and the negative wire should be connected to Pin B. The Kelvin temperature sensor is powered by a standard IEPE power supply found in most data collectors and on-line vibration monitoring systems. Supply current should be 0.4 to 5 mA when using the IEPE power supply. The temperature output will be in DC volts with a sensitivity of 10 mV_{DC}/K.

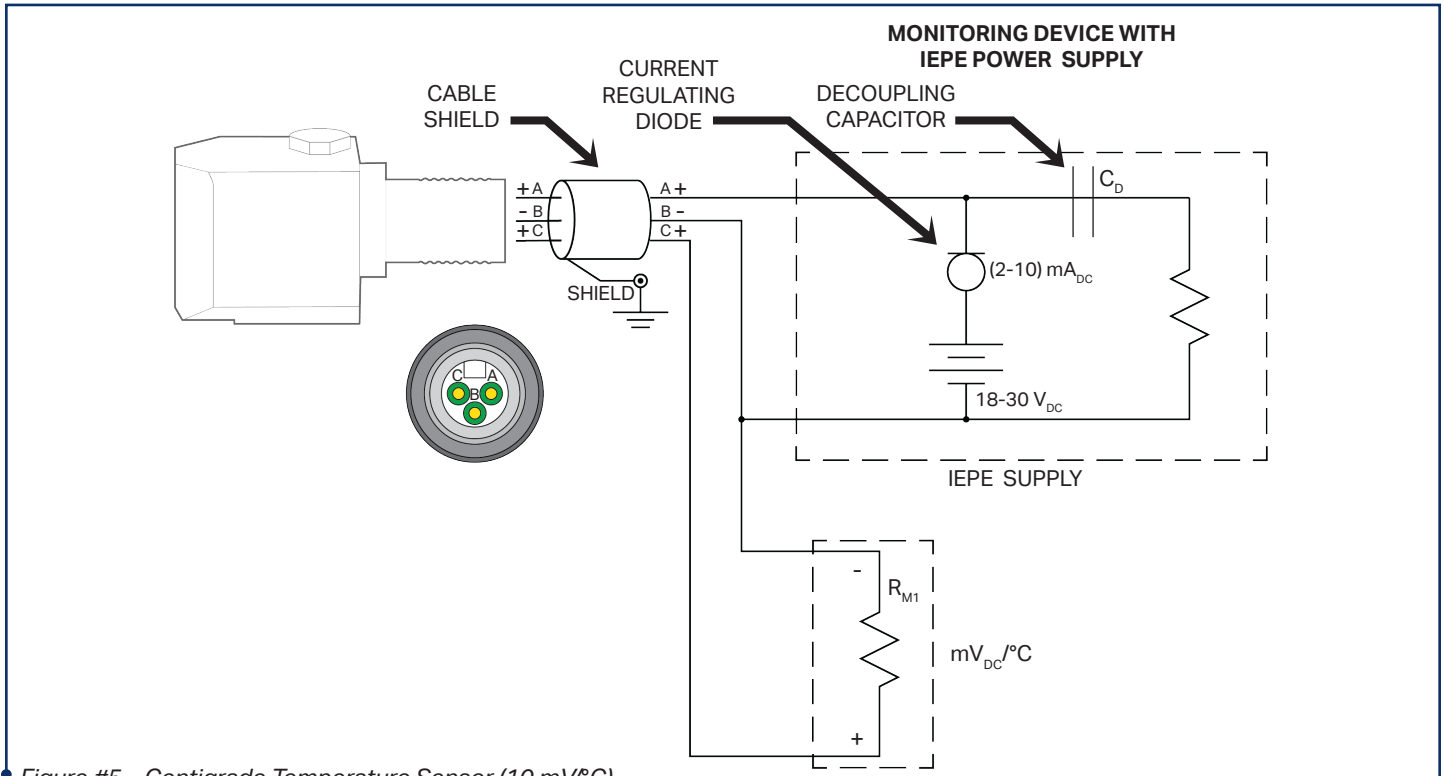


Figure #5 – Centigrade Temperature Sensor (10 mV/°C)

Centigrade 10 mV_{DC}/°C Temperature Sensors

The wiring diagram in Figure #5 illustrates the connections for a Centigrade temperature sensor utilizing an IEPE power supply, and Figure #6 illustrates the connections for a Centigrade temperature sensor using an independent power supply. Both power supplies will provide a temperature measurement with a sensitivity of 10 mV_{DC}/°C. The TC120 series (top exit) and TC124 series (side exit) sensors provide industrial-strength temperature measurements by incorporating a 316L stainless steel case with a 3 pin MIL 5015 C hermetic connector. The positive wire should be connected to Pin A, the negative wire would be a shared common connected to Pin B, and the positive temperature output will be on Pin C.

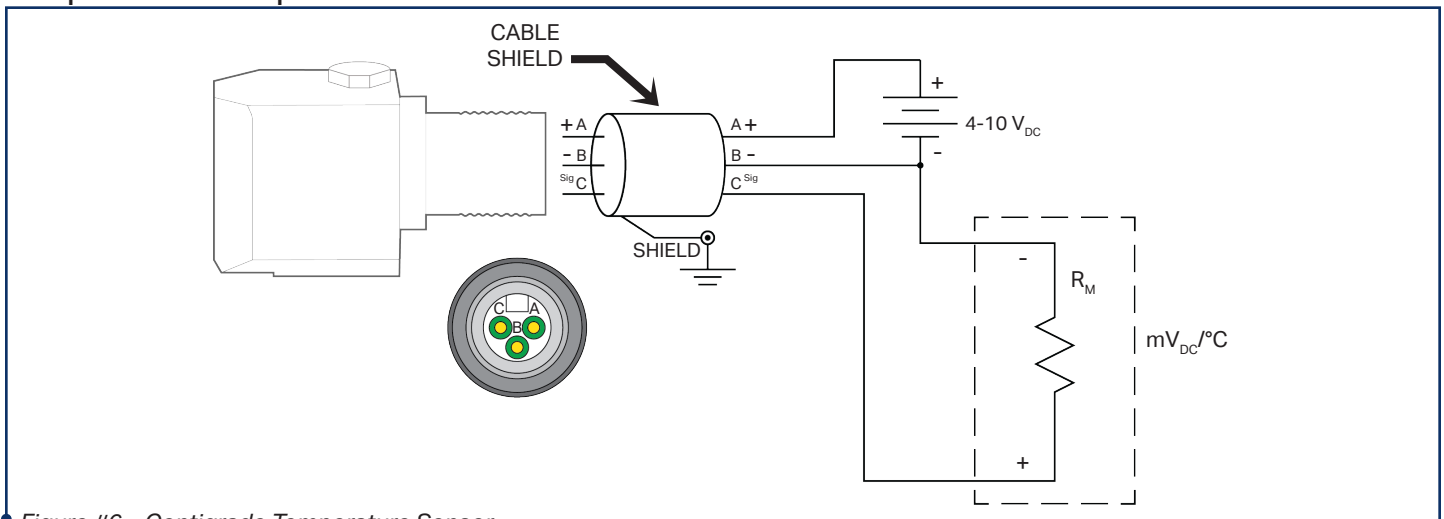


Figure #6 – Centigrade Temperature Sensor

CTC is the world leader in the design and manufacture of industrial accelerometers, piezo velocity transducers, 4-20 mA vibration sensors, and proximity probes as well as all related mounting hardware, cabling, and junction boxes. Our products enable efficient vibration monitoring for predictive maintenance in a wide variety of industries. Industries served include cement, mining, petrochemical, food & beverage, auto, steel, wind, paper & pulp, power generation, water & wastewater treatment, pharmaceutical, hospitals, bottling, and more. Our mission is to offer the widest variety of accelerometers and vibration hardware products, which are compatible with data collectors and online monitoring systems, as well as the tools for installation.



The PRO line offers 4-20mA vibration monitoring solutions and proximity probes.

All PRO products are backed by a lifetime warranty on materials and workmanship. PRO will repair or replace any of our products as long as the product was not subjected to misuse, neglect, natural disasters, improper installation, or modification.

All stock products qualify for a full refund if returned in new condition within 90 days of shipment. Build to order products qualify for a 50% refund if returned in new condition within 90 days of shipment. Custom products are quoted and built specifically to the requirements of the customer, which may include completely custom product designs or private labeled versions of standard products for OEM customers. Custom products ordered are non-cancellable, non-returnable and non-refundable.

