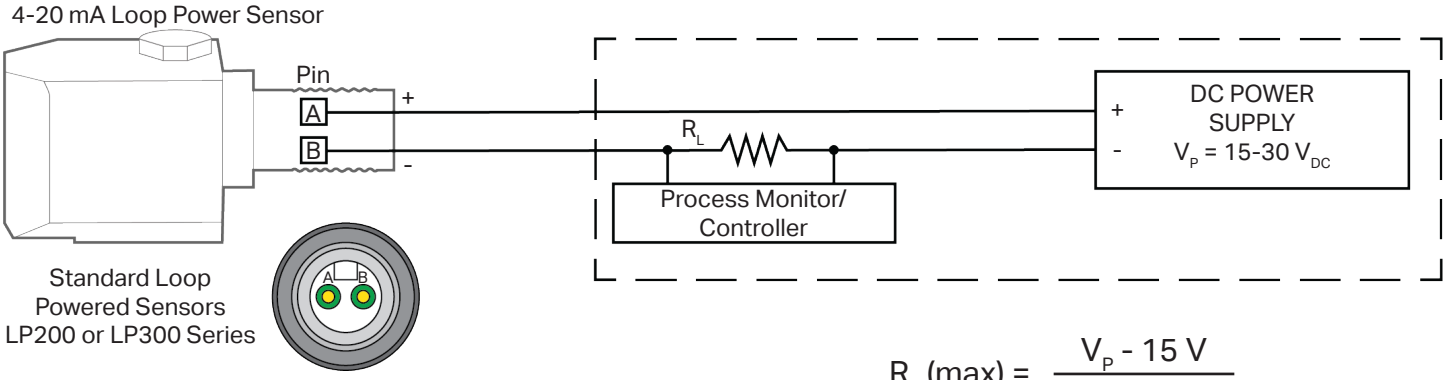
Loop Power, 4-20 mA Output Vibration Sensors

The purpose of the 4-20 mA analog current loop is to transmit the signal from an analog vibration sensor over a distance in the form of a current signal. PRO's loop power sensors output a 4-20 mA current that is proportional to the overall vibration of the equipment or machinery they are monitoring. This output current has a range of 4-20 mA (4 mA normally representing the sensor's zero-level output, and 20 mA representing the sensor's full-scale output).

Only two wires are required to send the current signal and also supply power to the sensor. A loop supply voltage is used to power the remote sensor. The remote sensor regulates the loop current such that the loop current represents the value of the parameter being measured by the sensor. A series resistor R_L at the loop power supply converts this current to a voltage that can be used by the process monitor/controller to record or distribute the parameter being measured.

Typical Loop Powered Circuit



$$R_L \text{ (max)} = \frac{V_P - 15\ V}{0.020\ A}$$

Loop Resistance Calculations

Standard Loop Powered Sensors

$$R_L \text{ (max)} = \frac{V_P - 15\ V \times (1\ mA/.001\ A)}{20\ mA}$$

***Instrinsically Safe Loop Powered Sensors**

$$R_L \text{ (max)} = \frac{V_P - 12\ V \times (1\ mA/.001\ A)}{20\ mA}$$

*Note: Typical Loop Powered Circuit will include an IS Barrier in the Circuit

Power Source Voltage (V_P)	Typical R_L (max) (Non-IS Sensors)	Typical R_L (max) (IS Sensors)
20	250	100
24	450	300
26	550	400
30	750	600

PROTECTION & RELIABILITY
OPTIMIZATION INSTRUMENTS
A CTC COMPANY

Product Manual

MNX10059 / REV A

MODEL LP232, LP234, LP332, LP334

Dual Output Loop Powered 4-20 mA Vibration Sensors with Temperature Outputs

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Section I
Overview

Introduction

This document contains information on the operation, installation and maintenance of the LP23X & LP33X series Dual Output Loop Powered 4-20 mA Vibration Sensors with Temperature output.

Description

The purpose of the 4-20 mA analog current loop is to transmit the signal from an analog vibration sensor over a distance in the form of a current signal. PRO line accelerometers output a low voltage (mV_{AC}) which is proportional to the overall vibration of the equipment or machinery they are monitoring. The low voltage dynamic signal is converted to a proportional output current, with the range of 4-20 mA_{DC} (4 mA representing the sensor's zero-level output, and 20 mA representing the sensor's full-scale output). A loop supply voltage is used to power a remote sensor. The remote sensor regulates the loop current such that the loop current represents the value of the parameter being measured by the sensor. A series resistor R_L at the loop power supply converts this current to a voltage that can be used by the process monitor/ controller to record or distribute the parameter being measured.

Dual Output LP23X & LP33X series sensors also contain an integrated circuit to measure the temperature inside the sensor case. We can monitor the temperature output in the form of mV_{DC}/°C using a voltmeter across pins C & B of the sensor when the circuit is powered by the 4-20mA loop at pins A & B.

POWER INPUT:	15 - 30 VDC
BANDPASS FILTER:	The Vibration Sensor contains a band-pass filter, consisting of a low-pass and a high-pass. The cutoff frequencies are specified at time of order.
ANALOG OUTPUT:	Full scale output of 4-20 mA(dc) Temperature Output (10mV$_{DC}$/°C)
OPERATION:	Filters the signal, and normalizes the output to the specified full-scale output. Performs a true PEAK or RMS conversion and transmits this data in a 4-20 mA format
DIMENSIONS:	See Data Sheet.
TEMPERATURE RANGE:	-40 degrees C to +85 degrees C

Table 1. Specifications

Note: Specifications on a particular Sensor may be obtained from the unit's datasheet, or call an Application Engineer for more information.

Section II
Installation

Typical Loop Powered Circuit

- Attach positive (+) input from the power supply to Pin A onto the sensor
- Attach negative (-) input from the power supply to Pin B of the sensor through an ammeter or load resistor (R_L)
- Attach a voltmeter between Pin C & Pin B of the sensor

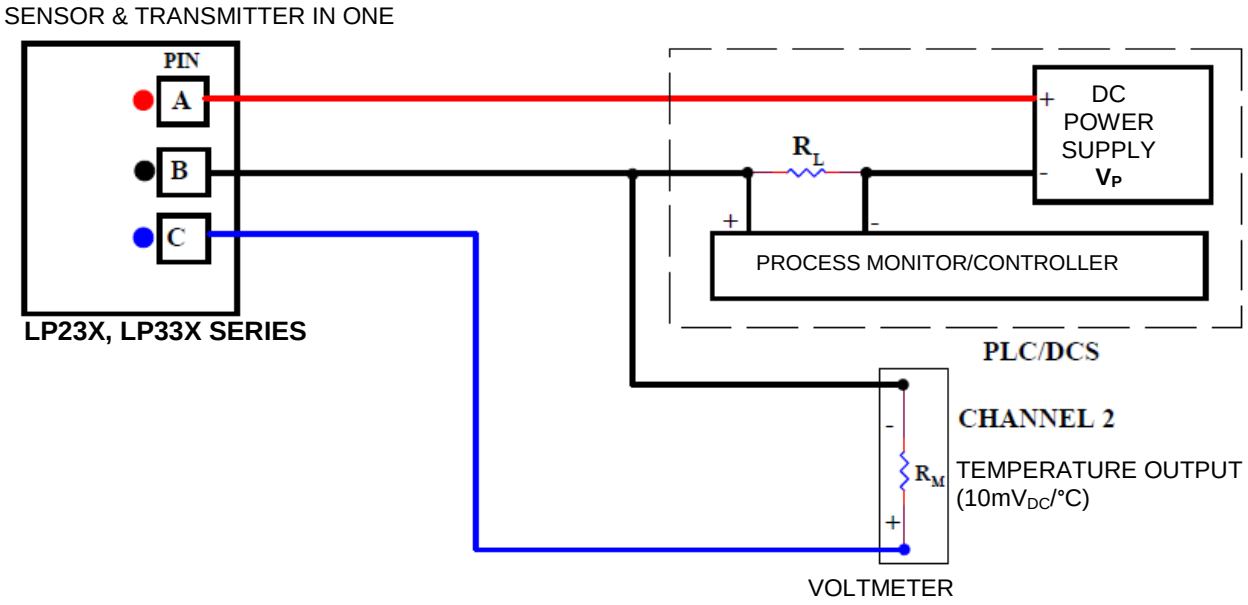

Figure 1. Typical Circuit

Loop Resistance Calculations

Maximum loop resistance can be calculated by:

$$R_{L\,(max)} = \frac{V_{POWER} - 15V}{20mA} \times \frac{1mA}{0.001A}$$

Temperature Calculations

$$\text{Temperature (°C)} = \frac{V_{OUT} - 0.5V}{10mV/°C} \times \frac{1mV}{0.001V}$$

Section III
Operation

Operating Procedure

1. To operate, make sure that all wires are properly connected, and then apply power.
2. Measurements - When reading the current output, use Table 2 below for expected output. If your range is not listed here, contact CTC for details. For temperature output use Table 3 & Figure 2

Full Scale Measurement Range	Actual Vibration	Expected mA Output at 100Hz
0 - 0.4 IPS (0 - 10 mm/s) (LP232, LP234 SERIES)	0	4
	0.1 IPS (2.5 mm/s)	8
	0.2 IPS (5.0 mm/s)	12
	0.3 IPS (7.5 mm/s)	16
	0.4 IPS (10 mm/s)	20
0-0.5 IPS (LP232, LP234 SERIES)	0	4
	0.125	8
	0.25	12
	0.375	16
	0.5	20
0 - 0.8 IPS (0 - 20 mm/s) (LP232, LP234 SERIES)	0	4
	0.2 IPS (5.0 mm/s)	8
	0.4 IPS (10.0 mm/s)	12
	0.6 IPS (15.0 mm/s)	16
	0.8 IPS (20.0 mm/s)	20
0-1.0 IPS (LP232, LP234 SERIES) 0-1.0 g (LP332, LP334 SERIES)	0	4
	0.25	8
	0.5	12
	0.75	16
	1	20
0-2.0 IPS (LP232, LP234 SERIES) 0-2.0 g (LP332, LP334 SERIES)	0	4
	0.25	6
	0.5	8
	0.75	10
	1	12
	1.25	14
	1.5	16
	1.75	18
	2	20

Table 2. Expected Output Ranges (Contd.)

Table 2. (Continued)

Full Scale Measurement Range	Actual Vibration	Expected mA Output at 100Hz
0-5.0 g (LP332, LP334 SERIES)	0	4
	1.25	8
	2.5	12
	3.75	16
	5	20
0-10.0 g (LP332, LP334 SERIES)	0	4
	1.25	6
	2.5	8
	3.75	10
	5	12
	6.25	14
	7.5	16
	8.75	18
	10	20
0-20.0 g (LP332, LP334 SERIES)	0	4
	2.5	6
	5	8
	7.5	10
	10	12
	12.5	14
	15	16
	17.5	18
	20	20

Table 2. Expected Output Ranges

Expected Output (V_{DC})	Degree C	Degree F
0.1	-40	-40
0.2	-30	-22
0.3	-20	-4
0.4	-10	14
0.5	0	32
0.6	10	50
0.7	20	68
0.8	30	86
0.9	40	104
1	50	122
1.1	60	140
1.2	70	158
1.3	80	176

Table 3. Expected Voltage Output at different temperatures (°C or °F)

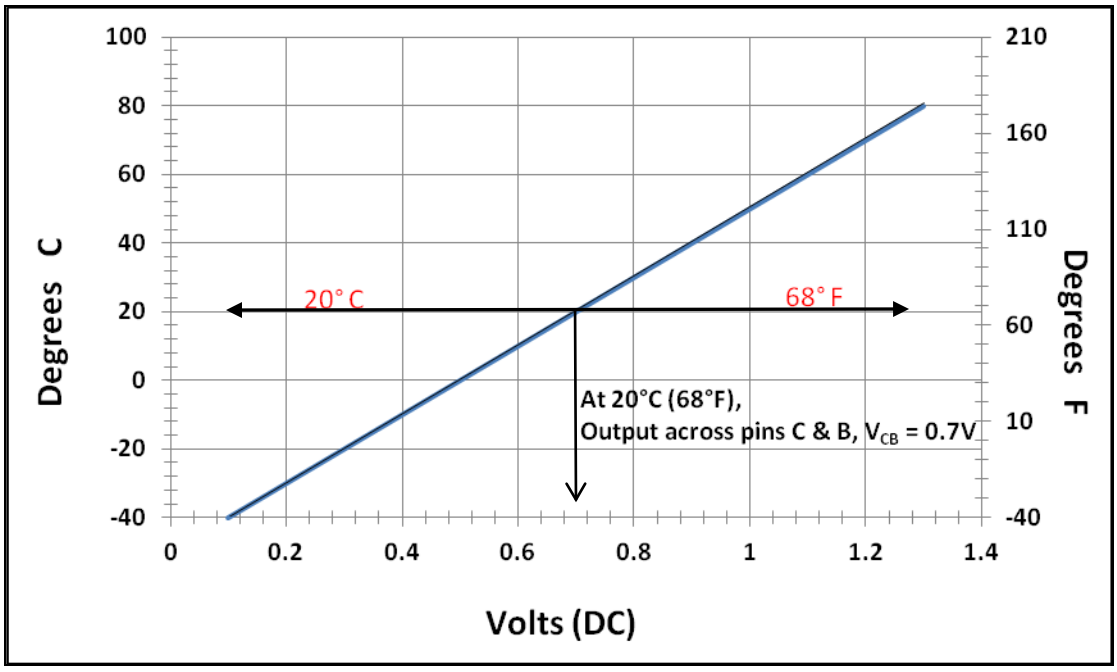

Figure 2. Graphical representation of the expected Voltage Output at different temperatures (°C or °F)

Section IV
Maintenance

General

There are no customer replaceable parts. This Sensor has been designed for trouble-free service under normal operating conditions.

Warranty

If any PRO product should ever fail, we will repair or replace it at no charge, as long as the product was not subjected to misuse, natural disasters, improper installation or modification which caused the defect.

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