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Loop Power Sensors LPS™ 4-20mA

4-20mA Output Vibration Transmitters

PC420 Vibration Transmitters, provide a 4-20 mA output signal proportional to an overall vibration level. This type of output is commonly accepted by process control systems such as Programmable Logic Controllers (PLC) or Distributed Control Systems (DCS). By connecting into process control systems, the user is able to monitor machinery condition without the investment and learning curve commonly associated with traditional vibration monitoring systems with data collection boxes and custom software.

Until recently, the most common method to obtain a 4-20mA signal for vibration was to connect a separate transmitter or signal conditioner to a standard accelerometer. This expensive and cumbersome practice has now been replaced by a single industrial sensor with the desired output. Loop Powered Sensors LPS™ contain an accelerometer and miniaturized transmitter all within the sensor. All LPS™ are constructed for the industrial environment with many of the features of standard industrial accelerometers, including stainless steel housings and hermetic sealing. LPS™ also use standard MIL-Style connectors. Power for these sensors is different than the constant current power required for accelerometers. As explained on the specification sheets, the sensor fully operates by using the power from the standard 4-20mA loop. No additional power is necessary. LPS™ will then produce a current output from 4mA to 20mA, which is proportional to the amount of vibration present across the specified frequency range of the sensor. No tuning pots are needed on Wilcoxon LPS™ because each unit is individually tuned and hermetically sealed at the factory.

Wilcoxon offers a wide variety of models to meet specific customer needs depending on the types of machinery to be monitored and the user environment. The performance of the intrinsically safe and explosion proof models are identical to that of the corresponding base models.

Wilcoxon's PC420 Product Family:

Base Models	Output Range	Intrinsically Safe Models			Explosion Proof Models
					
 PC420A PC420V		 PC420AE PC420VE	 PC420A-33 PC420V-33	 PC420A-33C PC420V-33C	 PC420A-33X PC420V-33X
PC420A-5	0 - 5 g	PC420AE-5	PC420A-5-33	PC420A-5-33C	PC420A-5-33X
PC420A	0 - 10 g	PC420AE	PC420A-33	PC420A-33C	PC420A-33X
PC420A-20	0 - 20 g	PC420AE-20	PC420A-20-33	PC420A-20-33C	PC420A-20-33X
PC420V-05	0 - 0.5 ips	PC420VE-5	PC420V-05-33	PC420V-05-33C	PC420V-05-33X
PC420V	0 - 1.0 ips	PC420VE-5	PC420V-33	PC420V-33C	PC420V-33X
PC420V-20	0 - 2.0 ips	PC420VE-20	PC420V-20-33	PC420V-20-33C	PC420V-20-33X
PC420V-30	0 - 3.0 ips	N/A	N/A	N/A	PC420V-30-33X
PC420V-50	0 - 5.0 ips	N/A	N/A	N/A	PC420V-50-33X
PC420V2	0 - 1.0 ips dynamic 100 mV/ips	N/A	N/A	N/A	N/A

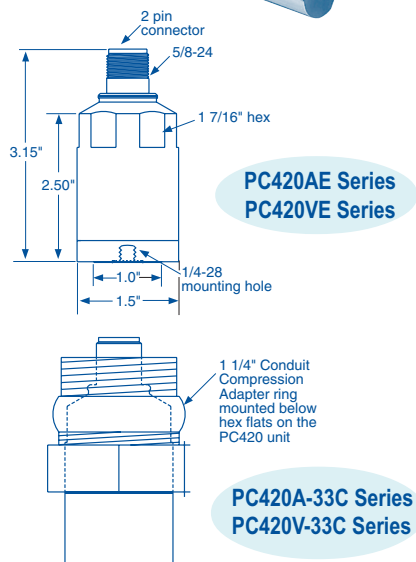
ACCELERATION VS. VELOCITY BASED MONITORING

**TECH
TIP**

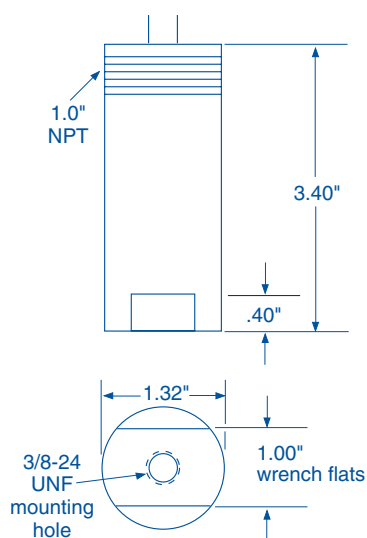
The application of velocity based monitoring is different from that of acceleration based. It is important to select a sensor that will provide useable data across the range and accommodate the amplitude range of the application. The majority of rotating machinery runs at 600 cpm to 3600 cpm. The sensor frequency range required to monitor vibration caused by imbalance and reciprocating forces is between 600 cpm and 120,000 cpm (10 Hz to 2000 Hz). For these machines and this type of monitoring, a velocity output sensor is best suited due to its increased sensitivity to low frequency vibration and de-emphasis of high frequency vibration.

With acceleration based monitoring, the sensor has increased sensitivity to higher frequencies. This allows more emphasis on the frequencies, which are indicative of bearing and gear mesh condition. However, very high levels of high frequency vibration from impacting gear teeth or metallic impact can overload the range of the accelerometer. In these cases, the velocity sensor is used to de-emphasize the high frequency signals.

In general, velocity sensing is preferred for general condition monitoring. Acceleration monitoring can be used for general bearing condition monitoring. If the accelerometer overloads due to high frequencies, switch to lower sensitivity or velocity monitoring sensor.



PC420A & PC420V
Intrinsically Safe Models



PC420A-33X & PC420V-33X
Explosion Proof Models

Models PC420AE, PC420VE & X

Intrinsically Safe & Explosion Proof 4-20 mA Loop Powered Sensors

How to interpret PC420 output?

PC420 sensors offer overall reading on machinery health. The following chart provides a general guideline on how to interpret the PC420 data.

Vibration Velocity in/sec. peak (mm/sec. r.m.s.)	Class I < 20 HP	Class II 20 to 100 HP	Class III > 100 HP typical rigid rotor	Class IV > 100 HP typical flexible rotor
2.5 (45)				D
1.6 (28)			D	D
1.0 (18)	D	D	D	D
0.6 (11.2)				C
0.4 (7.1)			C	
0.25 (4.5)		C		B
0.16 (2.8)	C		B	
0.1 (1.8)		B		
0.06 (1.12)	B			
0.04 (0.71)			A	A
0.025 (0.45)	A	A		
0.016 (0.112)				

Zone A: GOOD

The vibration of newly commissioned machines would normally fall within this zone.

Zone B: ACCEPTABLE

Machines with vibration within this zone are normally considered acceptable for unrestricted long-term operation.

Zone C: UNSATISFACTORY

Machines with vibration within this zone are normally considered unsatisfactory for long-term continuous operation. Generally, the machine may be operated for a limited period in this condition until a suitable opportunity arises for remedial action.

Zone D: UNACCEPTABLE

Vibration values within this zone are normally considered to be of sufficient severity to cause damage to the machine.

Class I

Individual parts of engines and machines, integrally connected to the complete machine in its normal operating condition. (Production electrical motors of up to 15kW are typical of machines in this category.)

Class II

Medium-sized machines (typically electrical motors with 15 kW to 75 kW output) without special foundations, rigidly mounted engines or machines (up to 300 kW) on special foundations.

Class III (Generally rigid rotor conditions)

Large prime-movers and other large machines with rotating masses mounted on rigid and heavy foundations, which are relatively stiff in the direction of vibration measurements.

Class IV (Generally flexible rotor conditions)

Large prime-movers and other large machines with rotating masses mounted on foundations, which are relatively soft in the direction of the vibration measurements (for example, turbogenerator sets and gas turbines with outputs greater than 10 MW).

Model PC420A Series

Acceleration, 4-20 mA Loop Powered Sensors (LPS™)



4-20mA OUTPUT

Output (±5%)	4-20 mA DC
Acceleration Range	see table below
Frequency Response:	
±3 dB	2 Hz - 2 kHz
Repeatability	±2%
Resonant Frequency, mounted, nominal	18 kHz
Transverse Sensitivity, max.	5%

ELECTRICAL

Power Requirements (Two wire loop power):	
voltage source	12 VDC - 36 VDC
Loop Resistance ¹ at 24 VDC, maximum	600Ω
Turn on Time	30 seconds
Grounding	Case isolated, internally shielded

ENVIRONMENTAL

Temperature Range	-40 to 85°C
Vibration Limit	250 g peak
Shock Limit	2,500 g peak
Sealing	Hermetic

PHYSICAL

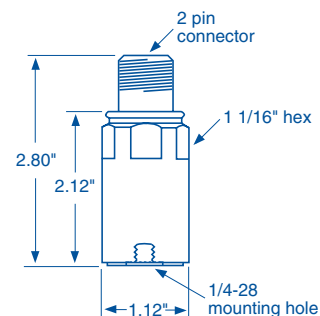
Sensing Element Design	PZT ceramic / shear
Weight	162 grams
Case Material	316L stainless steel
Mounting	1/4 - 28 tapped hole
Output Connector	2 pin, MIL-C-5015 style
Mating Connector	R6 type
Recommended Cabling	J9T2A

CONNECTOR PIN	FUNCTION
SHELL	ground
A	+ positive
B	- negative

FEATURES:

- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection
- No trim pots required

The output of the PC420A Series has a 4-20 mA output proportional to the amount of acceleration across the specified frequency range. An output of 4 mA indicates a level of 0 g's or no vibration present. A full-scale reading of 20 mA's indicates that the peak range of vibration is present.



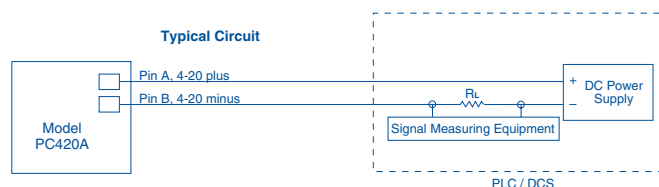
NOTES: ¹ Maximum loop resistance can be calculated by:

$$R_L (\text{max}) = \frac{V_{\text{power}} - 12 \text{ V}}{20 \text{ mA}}$$

Typical

Power Source Voltage	R _L max
20	400
24	600
26	700

ACCESSORIES SUPPLIED: SF6 mounting stud (International customers specify mounting requirements); Calibration data (level 2).



PC420A Series Models

MODEL	RANGE
PC420A-5	0 - 5 g, peak
PC420A	0 - 10 g, peak
PC420A-20	0 - 20 g, peak



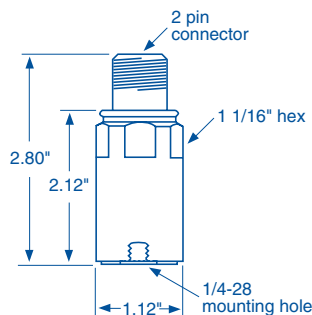
Model PC420V Series

Velocity 4-20 mA Loop Powered Sensors (LPS™)

FEATURES:

- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection
- No trim pots required

The output of the PC420V Series is proportional to velocity. An output of 4 mA indicates a level of 0 ips or no vibration present. A full-scale reading of 20 mA's indicates that the peak range of vibration is present.



4-20mA OUTPUT

Output (±5%)	4-20 mA DC
Velocity Range	see table below
Frequency Response:	
±3 dB	2 Hz - 2.0 kHz
Repeatability	±2%
Resonant Frequency, mounted, nominal	18 kHz
Transverse Sensitivity, max.	5%

ELECTRICAL

Power Requirements (Two wire loop power):	
voltage source	12 VDC - 36 VDC
Loop Resistance ¹ at 24 VDC, maximum	600Ω
Turn on time	30 seconds
Grounding	Case isolated, internally shielded

ENVIRONMENTAL

Temperature Range	-40 to 85°C
Vibration Limit	250 g peak
Shock Limit	2,500 g peak
Sealing	Hermetic

PHYSICAL

Sensing Element Design	PZT ceramic / shear
Weight	162 grams
Case Material	316L stainless steel
Mounting	1/4 - 28 tapped hole
Output Connector	2 pin, MIL-C-5015 style
Mating Connector	R6 type
Recommended Cabling	J9T2A

CONNECTOR PIN	FUNCTION
SHELL	ground
A	+ positive
B	- negative

NOTES: ¹ Maximum loop resistance can be calculated by:

$$R_L (\text{max}) = \frac{V_{\text{power}} - 12 \text{ V}}{20 \text{ mA}}$$

Typical

Power Source Voltage	R _L max
20	400
24	600
26	700

ACCESSORIES SUPPLIED:

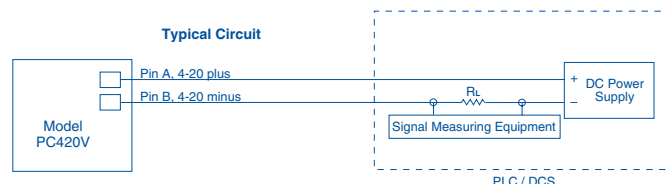
SF6 mounting stud (International customers specify mounting requirements); Calibration data (level 2).



PC420V Series Models

MODEL	RANGE
PC420V-05	0 - 0.5 ips, peak
PC420V	0 - 1.0 ips, peak
PC420V-20	0 - 2.0 ips, peak
PC420V-30	0 - 3.0 ips, peak
PC420V-50	0 - 5.0 ips, peak

Typical Circuit



Model PC420V2

Dual Output Velocity / Dynamic 4-20 mA Loop Powered Sensors (LPS™)

OUTPUT PARAMETERS

4-20 Output (±5%)	4-20 mA DC
Dynamic Output (±5%)	100 mV/in/sec
Velocity Range	0-1 in/sec peak
Frequency Response:	
±3 dB (4-20)	2 Hz - 2.0 kHz
±3 dB (Dynamic)	2 Hz - 3 kHz
Repeatability (4-20)	±2%
Resonant Frequency, mounted, nominal	18 kHz
Transverse Sensitivity, max.	5%

ELECTRICAL

Power Requirements (4-20 two wire loop power):	
voltage source	12 VDC - 36 VDC
load resistance ¹ at 24 VDC	600Ω
Powering (Dynamic) ² :	
voltage source	18 VDC - 30 VDC
current regulating diode	2 - 2.5 mA
Electrical Noise, equiv. in/sec, nominal (Dynamic):	
Spectral	
10 Hz	190 μin/sec/√Hz
100 Hz	80 μin/sec/√Hz
1,000 Hz	60 μin/sec/√Hz
Output Impedance (Dynamic), nominal	500 Ω
Bias Output Voltage (Dynamic), nominal	12 VDC
Turn on Time (4-20)	30 seconds
Turn on Time (Dynamic) ³	< 1 second
Grounding	case isolated, internally shielded

ENVIRONMENTAL

Temperature Range	-40 to 85°C
Vibration Limit	250 g peak
Shock Limit	2,500 g peak
Sealing	hermetic

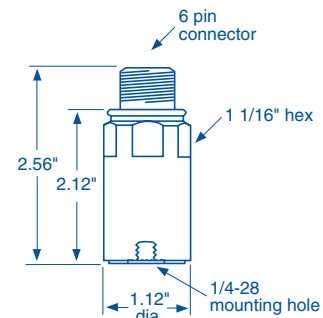
PHYSICAL

Weight	160 grams
Case Material	316L stainless steel
Mounting	1/4 - 28 tapped hole
Output Connector	6-pin, MIL-C-5015 style
Pin A	plus (4-20)
Pin B	minus (4-20)
Pin C	common (dynamic)
Pin D	signal (dynamic)
Pin E	n/c
Pin F	n/c
Mating Connector	R19 style, Amphenol PC06A-10-98S(SR)
Recommended Cable	J9T4A, 4 conductor, shielded, Teflon® jacket



FEATURES:

- Dual output: 4-20 mA and dynamic signal
- Corrosion resistant
- ESD protection
- Reverse wiring protection
- Overload protection
- No trim pots required



NOTES: ¹ Maximum load resistance can be calculated by:

$$R_L (\text{max}) = \frac{V_{\text{power}} - 12 \text{ V}}{20 \text{ mA}}$$

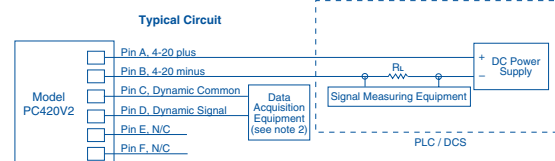
² For operation, the Dynamic Output also requires that the 4-20 loop be powered.

³ The 4-20 must be completely turned on prior to taking dynamic signal readings.



Typical

Power Source Voltage	R _L max
20	400
24	600
26	700



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