Wilcoxon Research

Contents

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www.wilcoxon.com
www.meggitt.com

August 2009

Class I Division 2 accelerometers

Wilcoxon adds six new sensors certified for use in Class I Division 2 (Zone 2) hazardous environments typically associated with the oil and gas, mining, steel, chemical processing, pharmaceutical, and petrochemical industries.

Class I Division 2 (Zone 2) general purpose accelerometers:

- Standard top exit **786A-D2**
- Standard side exit **787A-D2**
- Side exit with M8 mounting stud **787A-M8-D2**
- Compact for portable data collection **780A-D2**
- Integral cable **786F-D2**
- Dual output temperature sensor **786T-D2**

All sensors have a sensitivity of 100 mV/g, and a tight ±5% sensitivity tolerance, and are certified for installation in Class I Division 2, Groups A,B,C,D E, F, G and Class I Zone 2 AEx na IIC T4.

Customize suitable* mating cable assemblies to your application:

Cables:

> **J9T2A** twisted pair with yellow Teflon® jacket
> **J9T3A** 3-conductor with yellow Teflon® jacket
> **J10** twisted pair with grey Enviroprene jacket
> Standard and custom lengths

Connectors:

> **6D2** 2-pin connector, MIL-C-5015 style
> **6GD2** 3-pin connector, MIL-C-5015 style (compatible with the 786T-D2)
> Connectors can be lock wired to prevent them from inadvertently backing off the sensor

*Cable assemblies are deemed suitable for Class I Division 2 (Zone 2) installation. Final installation certification is determined by the governing authority.

The new Class I Division 2 (Zone 2) sensors expand Wilcoxon Research's already extensive hazardous area product offering. To view Wilcoxon's Intrinsically Safe and Explosion Proof accelerometers, velocity sensors, and 4-20 mA vibration sensors, go to http://www.wilcoxon.com/vi_intrinsic.cfm.

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M12-style vibration sensors

Wilcoxon introduces three new accelerometers plus cable assemblies with M12 connectors, an established sensor connector that is used throughout the world and is common in the process industries

New accelerometer models:

786A-M12: 100 mV/g ±5%, top exit, metric M8 stud mounted (1/4-28 and M6 options available)
787AM8-M12: 100 mV/g ±5%, side exit, metric M8 bolt mounted
787BM8-M12: 100 mV/g ±10%, side exit, metric M8 bolt mounted

Compatible connector-cable assemblies:

- Choose high temperature or molded assemblies
  - > Molded connector-cable assemblies are IP68-rated, suitable for environments up to 90° C (194° F). The model **RM12-J10** cable assembly is stripped and tinned on the opposite end and is available in standard lengths of 10, 16, 32, 64 feet.
  - > High-temperature connector-cable assemblies are IP67-rated and, at 125° C (257° F), these are **the highest temperature M12 connector-cable assemblies for accelerometers on the market!** The **RM12HT-J10** and **RM12HT-J9T2A** models come standard with a blunt cut on the opposite end and are available in custom lengths.
- Twisted pair cables with Teflon® or industrial-grade Enviroprene jacket
- All cables have a braided shield for signal integrity
- The assembly connectors have 5 sockets and are compatible with both 4-pin and 5-pin M12 sensor connectors
- Broad selection of other connector options or wire terminations

M12-style accelerometers for vibration monitoring of:

Motors
Pumps
Fans
Compressors
Vibrating conveyors
Chillers
Gearboxes
Reciprocating compressors
Blowers
Cooling towers
Mixers
Turbines
Centrifuges

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Press information

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July 15, 2009

Industrial high temperature 4-20 mA vibration sensors

Germantown, MD –– Wilcoxon Research, a Meggitt Group company and a leading supplier of quality accelerometers and sensor networks, has improved the performance of several popular 4-20 mA vibration sensors to operate in high temperature environments up to 105° C (221° F). Sensors with the new, higher temperature rating have a velocity or acceleration 4-20 mA output based upon RMS or Peak.

The 4-20 mA vibration sensor models beginning PC420AR (acceleration RMS), PC420AP (acceleration peak), PC420VR (velocity RMS), and PC420VP (velocity peak) were redesigned to perform at operating temperatures up to 105° C (221° F). "Our customers require vibration sensors designed to withstand the harsh industrial environment," said Tom Smith, Vice President of Sales and Marketing. "These sensors make affordable vibration trending available to customers with high temperature applications."

Wilcoxon's 4-20 mA sensors monitor rotating equipment and output a real time 4-20 mA signal proportional to the vibration level. By trending this real time data, plant personnel are able to schedule preventative maintenance activities around planned downtime, saving time and money in costly unexpected repairs. Integrating this signal into an existing PLC, DCS or SCADA system simplifies real time health monitoring because vibration, formerly considered too complex, can now be trended in easily understood units.

A wide variety of 4-20 mA vibration sensors are available to suit individual monitoring needs. Sensors are available with: top exit or side exit connectors; Intrinsically Safe and Explosion Proof ratings; monitoring acceleration, velocity or displacement; output based upon root-mean-square, peak, true-peak, or true peak-to-peak; and dual monitoring of vibration and temperature. Not all of Wilcoxon's 4-20 mA vibration sensors are rated to 105° C (221° F). Applications for Wilcoxon's 4-20 mA vibration sensors include compressors, motors, vibrating conveyors, seal-less pumps, chillers, gearboxes, pumps, exhaust fans, reciprocating compressors, blowers, cooling towers, mixers, gas/steam turbines and centrifuges.

To learn more about 4-20 mA vibration sensors, visit http://www.wilcoxon.com/vi_index.cfm?CatM_ID=5. To learn more about Wilcoxon Research, Inc., or the pledge of Total Lower Cost of Ownership, visit www.wilcoxon.com, call 800-WILCOXON, or email wilcoxon@meggitt.com.

ENDS

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Options for simplified 24/7 vibration monitoring

Option

1

4-20mA vibration sensor
Model PC420

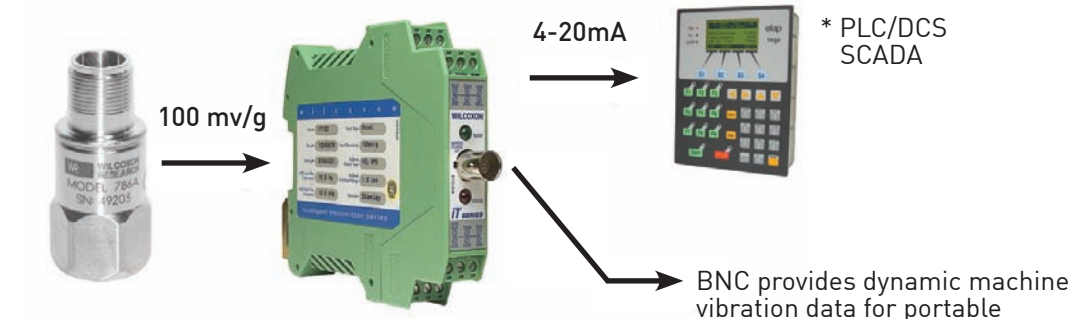
Relay alarm
Model iT401

2

4-20mA vibration sensor
Model PC420

* PLC/DCS
SCADA

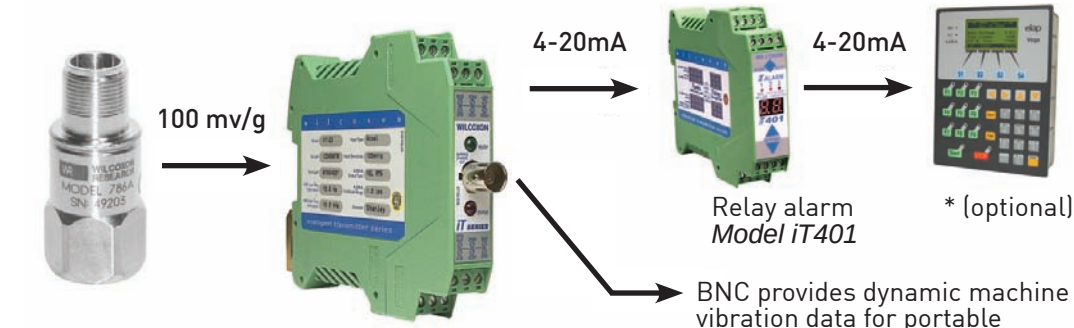
3



IEPE sensor
Model 786A

Signal conditioner
Model iT100

4



IEPE sensor
Model 786A

Signal conditioner
Model iT100

Relay alarm
Model iT401

* (optional)

Wilcoxon Research has the solutions to simplify your Condition Based Maintenance (CBM). We offer multiple continuous monitoring configurations, from single channel loop powered 4-20mA sensors connected to stand alone field relay modules to multi-channel systems integrated to a PLC, DCS, or SCADA system.

- 24/7 monitoring
- Alarming capabilities
- Scalable and cost-effective
- Overall vibration level in terms of acceleration, velocity, or displacement

*** PLC/DCS/SCADA not provided by Wilcoxon Research**

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smart engineering for
extreme environments

Wilcoxon Research

Product overview

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Wilcoxon's history

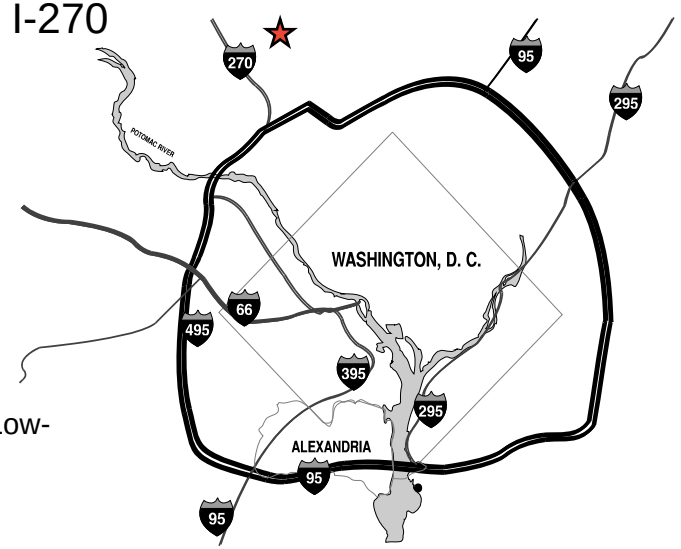
Wilcoxon Research is a leading manufacturer of vibration sensors and sensor systems. Over 40 years experience in the accelerometer industry and a reputation for unparalleled product quality make Wilcoxon's products the standard by which all other vibration sensors are measured.

- Founded in 1960 by engineers from the David Taylor Naval Research Lab. Initial market focus was the US Navy.
- Began manufacturing sensors for condition monitoring in the 1980's.
- Established our own advanced technology R&D group, Wilcoxon Labs, in 1999.
- Acquired by international aerospace, defense and electronics group Meggitt PLC in 2004. Other Meggitt group companies include Endevco and Vibro-Meter.

Wilcoxon today

Over 45 years after entering the vibration sensor industry, Wilcoxon is still a leading edge technology developer

- World-class manufacturer of industrial accelerometers
- Located in Metropolitan Washington DC along the I-270 Technology Corridor
  - 25,000 square feet (2,300 square meters)
  - 65 employees, 13 engineers
  - **NIST**-traceable calibration and testing
  - **ISO 9001:2000** certified, continuous registration since 1997
  - **ISO 14001:2004** certification since 2006
  - **AS9100** certified in 2009
  - Kanbans for production control and inventory management
  - Compliant with US export regulations, European WEEE, ESD, Low-Voltage, and RoHS directives



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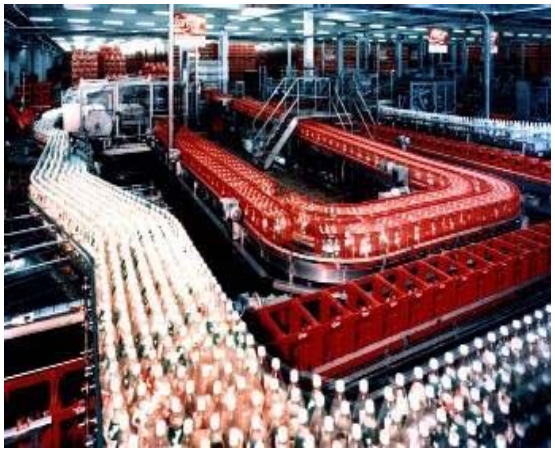
Equipment health monitoring industries

Wilcoxon offers vibration sensors and network accessories for condition based maintenance and process control monitoring vital to these industries

- Pulp and paper
- Machine tool
- Nuclear
- Power generation
- Petrochemical
- Food processing
- Pharmaceuticals
- Railways
- Wind power generation
- Steel making



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Aerospace, defense and maritime vibration and acoustic monitoring applications

- Helicopters
  - HUMS and AVM systems
- Submarines
  - Hull monitoring
  - Towed arrays
- Sonobuoys
- Shipboard sensors
  - Equipment health monitoring
- Homeland security

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The industry standard

Wilcoxon has a global reputation for providing the best industrial sensors on the market.

Whatever your application, our wide array of sensors is designed for reliable measurements in even the harshest plant environment. Top exit, side exit, integral cable, explosion proof housings and intrinsically safe vibration sensors are available. CE, FM, CSA, SIMTARS, and ATEX certification are available on many models. Wilcoxon performs helium leak tests to ensure a true hermetic seal, providing you excellent MTBF – up to 25 years on our most popular sensors. The quality of our sensors is the **standard** by which all other vibration sensors are measured.

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General purpose accelerometers

These sensors take vibration measurements across a broad frequency range for monitoring most industrial machinery

Predictive maintenance systems for all rotating equipment to include:

- Motors, fans, pumps
- Moderate speed gearboxes
- Machine tool spindles
- Paper machine rolls
- Compressors

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High performance accelerometers

- High temperature vibration sensors
  - 150ºC for IEPE-type accelerometers
  - Up to 260ºC for charge output sensors
- Low frequency accelerometers to 0.2 Hz, even lower for seismic sensors
  - Low speed applications
  - Petrochemical
  - Paper industries
- High frequency accelerometers to 29 kHz
  - High frequency gear mesh
  - Small bearings
- Triaxial accelerometers
  - Multi-directional data for additional analysis
  - Faster data collection

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Specialty accelerometers

- Dual output sensors measure vibration and temperature
  - Measure two critical parameters with one sensor
- PiezoVelocity transducers output a vibration signal relative to velocity
  - Paper machines
  - Pumps
- Seismic accelerometers measure vibration to the sub micro-g level, as low as 0.05 Hz
  - Control delicate processes such as integrated circuit manufacturing
  - Structural monitoring of bldgs, bridges and towers
- Underwater accelerometers
  - Continuous submersion to 650psi or 1,500ft
  - Underwater pumps
- Zerkometer® mounts where zerk fittings exist to grease bearings

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4-20 mA process control products: LPS™ and the Intelligent Transmitter Series

Many facilities want to monitor machinery vibration, but don't want an "expensive" vibration program. 4-20 mA products keep track of vibration levels so that maintenance professionals can take action on machines that start trending upward (higher vibration).

- Output signals fed to a process control computer (PLC/DCS/SCADA) or directly to an alarm module
- No trained analysts needed
- ISO 10816 offers guidance on vibration limits for rotating machinery

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4-20 mA transducers – LPS™

Wilcoxon offers the largest selection of 4-20 mA vibration sensors available.

Loop powered sensors (LPS™)

- An accelerometer and signal conditioner in one transducer
- Average the overall signal: acceleration, velocity or displacement
- Output is r.m.s., true peak, or pseudo-peak
- Loop powered
- Shaft speeds from 240 RPM (4Hz) to 120,000 RPM (2,000Hz)
- Top exit, side exit, integral cable, intrinsically safe and explosion proof models available

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Intelligent Transmitters (iT)

Wilcoxon's custom-built signal conditioning modules that interface with traditional accelerometers.

- 4-20 mA data output
- Dynamic data output on BNC front connector for more extensive vibration analysis
- Over 30,000 configurations available! Custom order your *iT* Transmitter:
  - Acceleration, velocity or displacement input
  - English or metric units
  - Output of r.m.s. or peak, or Wilcoxon's exclusive true peak or true peak-to-peak
  - Selectable full scale
  - 10 mV, 100 mV or 500 mV sensor input
  - Choose high-pass and low-pass filters from over 20 possibilities, also field adjustable

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iT401 Alarm

Relay alarm accepts 4-20 mA signal from the iT Transmitter or any loop powered sensor

- Interfaces with iT Transmitter modules (iT100/200) for 4-20 mA signal and power, without wiring
- Compatible with 4-20 mA signal from a variety of sensors, including: vibration, temperature, pressure, level, flow, force, and speed sensors
- Three alarm relays
- User-programmable settings
- Accurate to 1%

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Sensor networks: cables, mounting accessories and hardware

Wilcoxon manufactures a full line of cables, mounting accessories, power supplies and enclosures to provide customers with a complete sensor network.

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PVM 100 portable, handheld vibration meter

Carry this highly portable vibration meter in your shirt pocket. One-button operation switches between acceleration, velocity, and displacement – or click and hold for a digital reading.

The PVM 100 is supplied in a convenient carrying case with all the necessary accessories:

- Portable vibration meter
- 784A accelerometer
- Connector cable
- PT2 probe tip
- B3 magnet mount
- SF6 mounting stud
- Available in English or Metric units

Optional headphones can plug into a top-mounted jack for plant managers who need to further pinpoint a noise source.

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A full spectrum of custom cables

Wilcoxon builds cables to your specifications and our exacting standards

Wilcoxon offers a variety of cables and connectors to meet your vibration monitoring needs and beyond

- Select your cable
- Select your connector
- Extensive cable protection and environmental resistance options
  - Jacket options including Teflon® and spiral wrapped cable armor
  - Cables rated to 260ºC
  - Ingress protection ratings to IP68
- Custom cable orders are usually built in less than a week
- Many standard cables ship the same day

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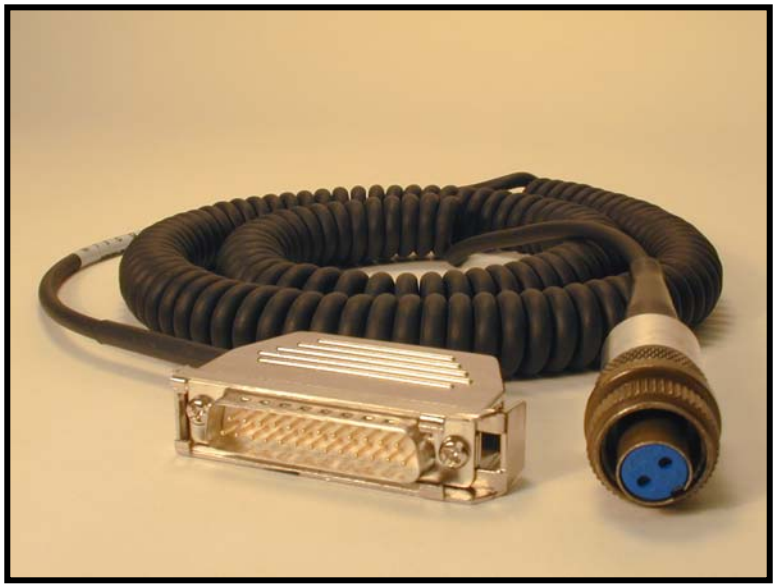
MaxFlex® cables for data collectors

Compatible with data collectors made by SKF, Emerson (CSI), and Rockwell (Entek IRD), Wilcoxon's MaxFlex® cables are designed to exceed the harsh environmental requirements of industrial applications. MaxFlex® cables have reinforced cable joints at the sensor connector end - the most common place that similar cables fail - to serve the needs of field data acquisition. They are rugged, reliable and resistant to abuse.

Why MaxFlex® is the best

- Extended life
- Reinforced for strength and maximum flexibility
- Pull tested to over 100 pounds
- Excellent EMI/RFI shielding



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Mounting accessories

When using piezoelectric sensors to measure vibration, the sensor must directly contact the machine surface. The more intimate and stiff the contact between sensor and the machine, the better the ability to couple and measure high frequency signals. Wilcoxon offers mounting options to fit virtually every machine and application. Below is a small sampling of Wilcoxon's most popular mounting accessories.

B3 flat magnet

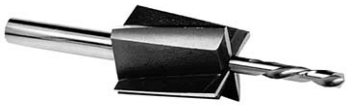
SF4 isolating stud

SF6 stud

SF22 isolator pad

B13 2-pole magnet

SF8 cementing pad



Spot facing tool

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Enclosures

Junction boxes simplify taking route data by making multiple channels of vibration output available at one source for the fastest walk around data collection.

- Terminal boxes
- Junction boxes
- Switchable/multi-channel junction boxes
- Switch boxes
- Expandable switchable junction boxes

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Monitoring Essentials™ are

Guaranteed In Stock

Wilcoxon Research is known for providing the highest quality sensors with the shortest lead times in the industry. Now, your wait is even shorter for Wilcoxon's most popular vibration monitoring products!

- Your Monitoring Essentials™ order ships the next day! There are no expediting fees and no minimum order quantities.
- A maximum of 10 of any Monitoring Essentials™ part number are guaranteed to be in stock.
- The guarantee is also backed with a 5% discount if the Monitoring Essentials™ items are not in-stock at the time of order.

www.wilcoxon.com/MonitoringEssentials

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Precisely what you need

Thank you

For more information, please contact Wilcoxon's customer sales and service team.

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extreme environments

Product selection guide

Individual specification sheets follow

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Page	Model #	Sensitivity	Sensitivity tolerance	Frequency response @ 3db	Resonance	Exit type / connector	Max temp.	Mounting thread	P.s.d. noise @ 100 Hz	Acceleration range	Weight	Haz area option
				Hz	kHz		C		/√Hz	g peak	grams	
	General purpose accelerometers											
33	793	100mV/g	+5%	0.5 - 15k	25	top, R6 2 pin	120°	1/4-28	5 µg	80	112	Y
35	797	100mV/g	+5%	1.0 - 12k	26	side, R6 2 pin	120°	1/4-28	5 µg	50	135	Y
37	786A	100mV/g	+5%	0.5 - 14k	30	top, R6 2 pin	120°	1/4-28	5 µg	80	90	Y
39	786A-M12 **NEW!**	100mV/g	+5%	0.5 - 14k	30	top, M12	120°	M8	5 µg	80	90	
41	786F	100mV/g	+5%	0.5 - 13k	30	top, integral cable	120°	1/4-28	5 µg	80	90	Y
43	787A	100mV/g	+5%	0.7 - 10k	22	side, R6 2 pin	120°	1/4-28	5 µg	80	145	Y
45	787AM8-M12 **NEW!**	100mV/g	+5%	0.7 - 10k	22	side, M12	120°	M8	5 µg	80	145	
47	787B	100mV/g	+10%	0.7 - 10k	22	side, R6 2 pin	120°	1/4-28	5 µg	80	145	
49	787F **NEW!**	100mV/g	+10%	0.7 - 10k	22	side, integral cable	120°	1/4-28	5 µg	80	145	
51	780A **NEW!**	100mV/g	+5%	0.4 - 14k	30	top, R6 2 pin	120°	1/4-28	5 µg	80	62	Y
53	780B **NEW!**	100mV/g	+10%	0.4 - 14k	30	top, R6 2 pin	120°	1/4-28	5 µg	80	62	
53	780C **NEW!**	100mV/g	+15%	0.4 - 14k	30	top, R6 2 pin	120°	1/4-28	5 µg	80	62	
55	785A	100mV/g	+10%	1 - 12k	30	side, R6 2 pin	120°	1/4-28	6 µg	80	85	
57	793R (radiation environment suitable)	100mV/g	+5%	1 - 15k	26	top, R6 2 pin	120°	1/4-28	5 µg	50	110	
59	797R (radiation environment suitable)	100mV/g	+5%	1 - 12k	26	side, R6 2 pin	120°	1/4-28	5 µg	50	135	
61	775A	100mV/g	+20%	0.5 - 10k	26	top, R35	120°	1/4-28	5 µg	80	45	
	Low frequency accelerometers											
63	793L	500mV/g	+5%	0.2 - 2.3k	15	top, R6 2 pin	120°	1/4-28	0.2 µg	10	142	Y
65	797L	500mV/g	+5%	0.2 - 3.7k	18	side, R6 2 pin	120°	1/4-28	0.2 µg	10	148	Y
67	799LF	500mV/g	+5%	0.1 - 2.5k	18	top, R6 2 pin	120°	1/4-28	1 µg	10	205	
69	786-500 **NEW!**	500mV/g	+5%	0.2 - 14k	30	top, R6 2 pin	120°	1/4-28	1.5 µg	10	90	
71	799M	1000mV/g	+5%	0.2 - 2.5k	18	top, R6 2 pin	80°	1/4-28	1 µg	5	205	
	High frequency accelerometers											
73	712F	100mV/g	+10%	3.0 - 25k	>45	side, integral cable	120°	8-32	10 µg	60	35	
75	732A/732AT	10mV/g	+5%	0.5 - 25k	60	side, R1 10-32, coaxial	120°	10-32	3 µg	500	13	
77	736/736T	100mV/g	+5%	2.0 - 25k	60	side, R1 10-32, coaxial	120°	10-32	2 µg	50	13	
79	997	10mV/g	+10%	0.5 - 29k	50	side, integral cable	125°	8-32	9 µg	600	35	
	Piezovelocity transducers											
81	793V	100mV/in/sec	+10%	1.5 - 7k	15	top, R6 2 pin	120°	1/4-28	1µin/sec	50 in/sec	145	Y
83	797V	100mV/in/sec	+10%	1.6 - 7k	18	side, R6 2 pin	120°	1/4-28	0.8 µin/sec	50 in/sec	148	Y
85	793VR (radiation environment suitable)	100mV/in/sec	+10%	2 - 7k	15	top, R6 2 pin	120°	1/4-28	1 µin/sec	50 in/sec	133	
	Triaxial accelerometers											
87	993A	100mV/g	+10%	2 - 2k	N/A	side, R9W 4 pin	120°	1/4-28	2 µg	50	88	
89	993B Series	25, 50, 100mV/g	+10%	2 - 10k (z axis) 2 - 7k (x&y axis)	N/A	top, integral cable	120°	10-32	3.2, 2.0, 1.4 µg	40	134	Y

Product selection guide

Individual specification sheets follow

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Page	Model #	Sensitivity	Sensitivity tolerance	Frequency response @ 3db	Resonance	Exit type / connector	Max temp.	Mounting thread	P.s.d. noise @ 100 Hz	Acceleration range	Weight	Haz area option
				Hz	kHz		C		/√Hz	g peak	grams	
	High temperature accelerometers											
91	376	25 pC/g	+10%	1 - 12k	30	top, R1 10-32 coaxial	260°	1/4-28	N/A	N/A	75	Y
93	376/CC701HT	100mV/g	+10%	1 - 12k	30	inline, 10-32 coaxial	260°	1/4-28	7 µg	50	75	
95	793-6	100mV/g	+10%	1 - 12k	20	top, R6 2 pin	150°	1/4-28	3 µg	50	135	
97	797-6	100mV/g	+10%	1 - 11k	20	side, R6 2 pin	150°	1/4-28	3 µg	50	145	
	4-20 mA vibration output sensors											
99	PC420A acceleration, RMS and peak	4-20 mA	+5%	1 - 2k	N/A	top, R6 2 pin	105°	1/4-28	N/A	5,10,20 g	162	Y
101	PC420A acceleration, true peak	4-20 mA	+5%	4 - 2k	N/A	top, R6 2 pin	85°	1/4-28	N/A	5,10,20 g	162	Y
103	PC420V velocity, RMS and peak	4-20 mA	+5%	3.5 - 2k	N/A	top, R6 2 pin	105°	1/4-28	N/A	0.5,1,2,3,5 ips	162	Y
105	PC420V velocity, true peak	4-20 mA	+5%	4 - 2k	N/A	top, R6 2 pin	85°	1/4-28	N/A	0.5,1,2,3,5 ips	162	Y
107	PC420D displacement **NEW!**	4-20 mA	+5%	10 - 1k	N/A	top, R6 2 pin	85°	1/4-28	N/A	40 mils	162	
109	PC421 low profile	4-20 mA	+5%	4 - 2k	N/A	side, R6 2 pin	85°	1/4-28	N/A	5,10,20 g	320	Y
111	PC423 integral cable, low profile	4-20 mA	+5%	4 - 2k	N/A	side, integral cable	85°	1/4-28	N/A	5,10,20 g	320	Y
	Dual output vibration (4-20 mA) and temperature sensors											
113	PC425 low profile	4-20 mA	+5%	4 - 2k	N/A	side, R19 6 pin	85°	1/4-28	N/A	5,10,20 g	320	
115	PC427 integral cable, low profile	4-20 mA	+5%	4 - 2k	N/A	side, integral cable	85°	1/4-28	N/A	5,10,20 g	320	
	Dual output vibration and temperature sensors											
117	793T-3	100mV/g	+5%	0.5 - 15k	24	top, R6G 3 pin	120°	1/4-28	5 µg	80	115	
119	797T-1	100mV/g	+5%	1 - 12k	26	side, R6G 3 pin	120°	1/4-28	5 µg	80	135	
121	797LT	500 mV/g	+5%	0.2 - 3.7k	18	side, R6G 3 pin	120°	1/4-28	0.2 µg	10	160	
123	786T	100mV/g	+5%	0.5 - 12k	30	top, R6G 3 pin	120°	1/4-28	5 µg	60	90	Y
	Specialty sensors											
125	221A	100mV/g	+10%	0.5 - 7k	13	top, R35	80°	1/4-28	5 µg	80	53	
127	221B	100mV/g	+20%	0.5 - 10k	18	top, R35	80°	1/8-27 NPT	5 µg	80	57	
129	222A	100mV/g	+20%	0.5 - 8.5k	23	top, R6 2 pin	120°	1/8-27 NPT	5 µg	80	76	
	Leak detection sensors											
131	996LD	12V/g	+3dB	10 - 4k	14	top, R6 2 pin	80°	1/4-28	0.08 µg	0.2	-	
133	H571LD-1A	-187dB re 1VµPa	+3dB	5.0 - 20k	N/A	top, R4 3 pin	80°	3/4-14 NPT	N/A	N/A	-	
135	H571LD-2	-175dB re 1VµPa	+3dB	5.0 - 20k	N/A	top, R4 3 pin	80°	3/4-14 NPT	N/A	N/A	-	
	Test and measurement sensors											
137	726/726T	100mV/g	+5%	0.6 - 15k	32	side/top, 10-32 coaxial	120°	10-32	0.8 µg	80	30-34	
139	728A/728T	500mV/g	+5%	1.0 - 10k	24	side/top, 10-32 coaxial	120°	10-32	0.3 µg	15	45	

Product selection guide

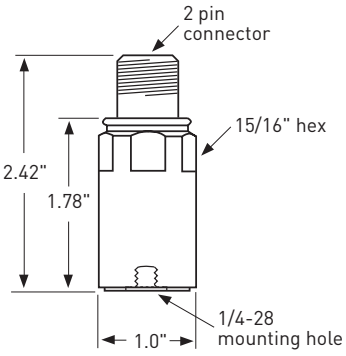
Individual specification sheets follow

Wilcoxon Research

Page	Model #	Sensitivity	Sensitivity tolerance	Frequency response @ 3db	Resonance	Exit type / connector	Max temp.	Mounting thread	P.s.d. noise @ 100 Hz	Acceleration range	Weight	Haz area option
				Hz	kHz		C		/√Hz	g peak	grams	
	Seismic sensors											
141	731A	10V/g	+10%	0.05 - 500	0.815	top, R6 2 pin	65°	3/8-16	0.004 µg	0.5	670	
143	731A/P31	10-1000V/g	10%	0.05 - 500	0.815	BNC	65°	3/8-16	0.004 µg	0.5	670	
145	731-207	10V/g	+10%	0.2 - 1.3k	2.4	top, 10-32 coaxial	80°	10-32	0.03 µg	0.5	50	
147	731-207R	10V/g	+10%	0.2 - 1.3k	2.4	top, 10-32 coaxial	80°	10-32	0.03 µg	0.5	77	
	Underwater accelerometers and hydrophones											
149	746	100mV/g	+5%	1.0 - 15k	30	top, integral cable	80°	10-32	0.8 µg	50	45	
151	754	10mV/g	+10%	2.0 - 25k	60	side, integral cable	80°	Adhesive	4 µg	250	4	
153	757	100mV/g	+10%	2.0 - 2k (at 10%)	-	side, integral cable	80°	10-32	1 µg	50	110	
155	H505L-2-XXX hydrophone	-160dB re 1VµPa	+10%	20 - 10,000 Hz	-	integral cable	80°	N/A	34 µPa	N/A	-	
	Helicopter sensors											
157	991D	40mV/g	+5%	0.5 - 12k	20	top, R4 3 pin	120°	1/4-28	1.3 µg	40	54	
159	991D-1	20mV/g	+5%	.4 - 12k	20	top, R4 3 pin	120°	1/4-28	11 µg	250	54	
161	991V	20mV/ips	+10%	2.5 - 7k	20	top, R4V 4 pin	120°	1/4-28	9 µg	400 in/sec	55	
	Other products											
163	Intelligent Transmitter											
165	iT Alarm											
167	iT Communications module											
22	Cables, *in the product overview on page 22 and also located in the brochure, "A full spectrum of custom cables"*											
22	Connectors, *in the product overview on page 22and also located in the brochure, "A full spectrum of custom cables"*											
23	MaxFlex Data Collector Cables, *in the product overview on page 23 and also located in the brochure, "A full spectrum of custom cables"*											
24	Mounting accessories, *in the product overview on page 24 and also located in the Short Form Catalog on page 11*											
25	Switch and termination enclosures, *in the product overview on page 25 and also located in the Short Form Catalog on page 12*											
Catalog	Power and signal conditioning, *located in the Short Form Catalog on page 12*											
Catalog	Vibration shakers, *located in the Short Form Catalog on page 13*											
Catalog	Portable vibration meter, *located in the Short Form Catalog on page 14*											

Model 793
Premium PiezoFET®accelerometer

Features
- Corrosion resistant
- Ground isolated
- Rugged design
- Hermetic seal
- ESD protection
- Reverse wiring protection
- Over - current protection



Dynamic

Sensitivity, ±5%, 25°C		100 mV/g
Acceleration range		80 g peak
Amplitude nonlinearity		1%
Frequency response:		
±5%		1.5 - 5,000 Hz
±10%		1.0 - 7,000 Hz
±3 dB		0.5 - 15,000 Hz
Resonance frequency		25 kHz
Transverse sensitivity, max.		5% of axial
Temperature response:		
–50°C		–10%
+120°C		+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	600 µg
Spectral	10 Hz	8 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedence, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g
Sealing	hermetic
Base strain sensitivity	0.0005 g/µstrain

Physical

Sensing element design	PZT ceramic / compression
Weight	112 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 cable	J10 / J9T2A

Connector Pin	Function
Shell	ground
A	power/ signal
B	common

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 3)

Options: Intrinsic safety certifications (consult factory)

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MEGGiTT
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Model 797
Premium, PiezoFET®, low profile IsoRing accelerometer

Dynamic

Sensitivity, ±5%, 25°C		100 mV/g
Acceleration range		50 g peak
Amplitude nonlinearity		1%
Frequency response:		
±5%		3 - 5,000 Hz
±10%.		2 - 7,000 Hz
±3 dB		1 - 12,000 Hz
Resonance frequency		26 kHz
Transverse sensitivity, max		5 % of axial
Temperature response:		
–50°C		–5%
+120°C		+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	600 µg
Spectral	10 Hz	8 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

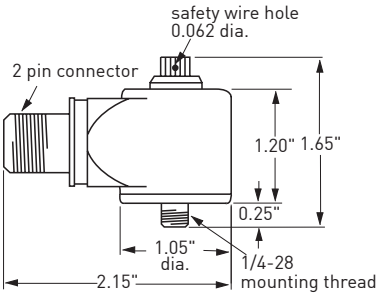
Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g	30 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	138 grams
Case material	316L stainless steel
Mounting	1/4-28 captive socket head screw
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J10 / J9T2A

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- Ground isolated
- ESD protection
- Reverse wiring protection
- Mounting in any orientation



Connector pin	Function
Shell	ground
A	power/ signal
B	common

Accessories supplied: #12105-01captive socket head (metric stud available upon request); calibration data (level 3)
Options: Intrinsic safety certifications (consult factory)

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98244 Rev.C.3 12/07

Model 786A
General purpose accelerometer

Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response:	
± 5%	3 - 5,000 Hz
±10%	1 - 9,000 Hz
± 3 dB	0.5 - 14,000 Hz
Resonance frequency	30 kHz
Transverse sensitivity, max	5% of axial
Temperature response:	
–50°C	–5%
+120°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

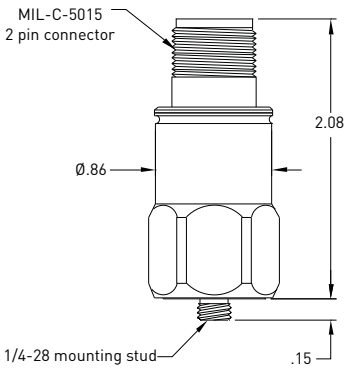
Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv g, max	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max	0.0002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	90 grams
Case material	316L stainless steel
Mounting	1/4 - 28 UNF tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J10 / J9T2A

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- Case isolated
- ESD protection
- Reverse wiring protection
- EMI/RFI shielded



Connector pin	Function
Shell	ground
A	power/ signal
B	common

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2)

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98692 Rev.A.3 7/09

786A-M12
General purpose accelerometer

Features
- M12 connector
- Hermetic seal
- Rugged design
- Corrosion resistant
- Case isolated
- ESD protection

Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response:	
± 5%	3 - 5,000 Hz
±10%	1 - 9,000 Hz
± 3 dB	0.5 - 14,000 Hz
Resonance frequency	30 kHz
Transverse sensitivity, max	5% of axial
Temperature response:	
–50°C	–5%
+120°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		Case isolated, internally shielded

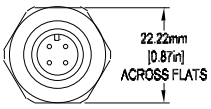
Environmental

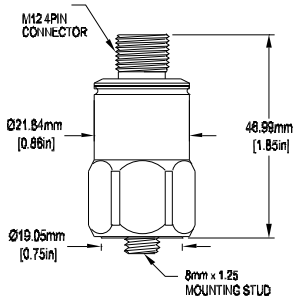
Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv g, max	70 µg/gauss
Sealing	Hermetic
Base strain sensitivity, max	0.0002 g/µstrain

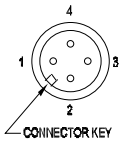
Physical

Sensing element design	PZT ceramic / shear
Weight	90 grams
Case material	316L stainless steel
Output connector	4 pin, M12-style
Mating connector	M12-style
Recommended cabling	J10 / J12
Mounting	stud, SF6M (M8)

Connector pin	Function
Shell	Ground
Pin 1	Power / signal
Pin 2	Common
Pin 3	N/C
Pin 4	N/C







Accessories supplied: SF6M mounting stud; calibration data (level 2)

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98998 Rev A 7/09

Models 786F
General purpose, integral cable accelerometer

Dynamic

Sensitivity, ±5%, 25 °C		100 mV/g
Acceleration range		80 g peak
Amplitude nonlinearity		1%
Frequency response, nominal:		
±10 %		1 - 8,000 Hz
±3 dB		0.5 - 13,000 Hz
Resonance frequency		30 kHz
Transverse sensitivity, max		5% of axial
Temperature response:		
–50°C		–5%
+120°C		+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

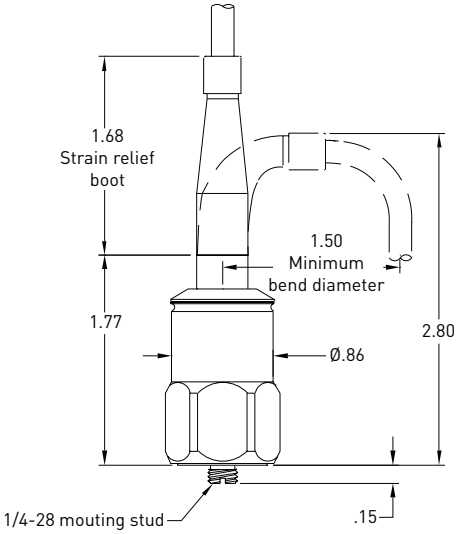
Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g
Shock limit, min	5,000 g
Electromagnetic sensitivity, equiv. g, max	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max	0.0002 g/µstrain
Hydrostatic pressure	100 psi

Physical

Sensing element design	PZT ceramic / shear
Weight	90 grams
Case material	316L stainless steel
Mounting	1/4 - 28 UNF tapped hole
Integral cabling	J9T2A, 16 ft., blunt cut

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- Case isolated
- ESD protection
- Reverse wiring protection



Function	786F cable conductor
Power/signal	white
Common	black
Case	shield

Accessories supplied: SF6 mounting stud (international customers specify mounting requirements); calibration data (level 2).

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98504 Rev.C.3 12/07

Model 787A
Low profile, general purpose accelerometer

Dynamic

Sensitivity, ±5%, 25°C		100 mV/g
Acceleration range		80 g peak
Amplitude nonlinearity		1%
Frequency response:		
±10%		1.0 - 5,000 Hz
±3 dB		0.7 - 10,000 Hz
Resonance frequency		22 kHz
Transverse sensitivity, max		5% of axial
Temperature response		–50°C –5% +120°C +5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g
Shock limit, min	5,000 g
Electromagnetic sensitivity, equiv. g, max	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max	0.002 g/µstrain

Physical

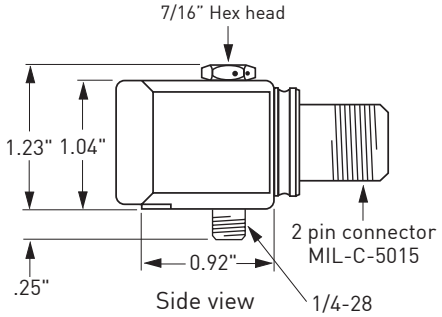
Sensing element design	PZT ceramic / shear
Weight	145 grams
Case material	316L stainless steel
Mounting	1/4 - 28 captive hex head screw with 0.046" diameter safety wire hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J10 / J9T2A

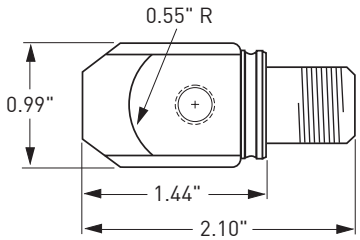
Connector pin	Function	Cable conductor color
Shell	ground	Shield
A	power/ signal	White
B	common	Black

Accessories supplied: #80165-01 captive hex head screw; calibration data (level 2).

Features

- Corrosion resistant
- Hermetic design
- Ground isolated
- ESD protection
- Reverse wiring protection
- Mounts in any orientation





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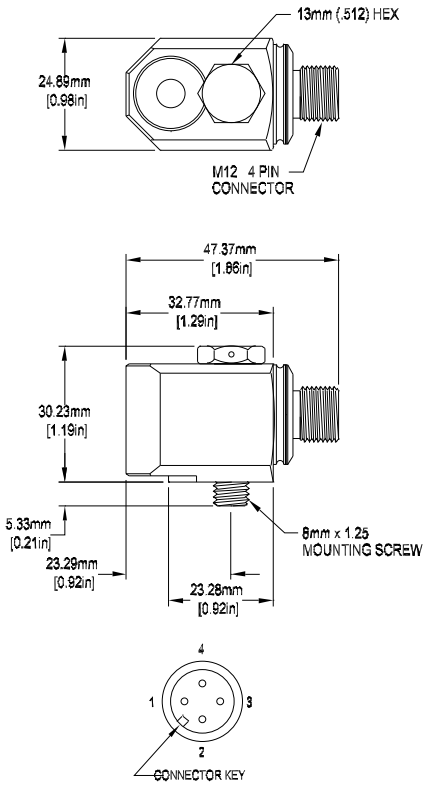
98493 Rev.E 12/08

787AM8-M12
Low profile, general purpose accelerometer

Features
- M12 connector
- Hermetic seal
- Rugged design
- Corrosion resistant
- Case isolated
- ESD protection



Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response:	
±10%	1.0 - 5,000 Hz
± 3 dB	0.7 - 10,000 Hz
Resonance frequency	22 kHz
Transverse sensitivity, max	5% of axial
Temperature response:	
–50°C	–5%
+120°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		Case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv g, max	70 µg/gauss
Sealing	Hermetic
Base strain sensitivity, max	0.002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	145 grams
Case material	316L stainless steel
Output connector	4 pin, M12-style
Mating connector	M12-style
Recommended cabling	J10 / J12
Mounting	captive screw, M8 thread

Connector pin	Function
Shell	Ground
Pin 1	Signal / power
Pin 2	Common
Pin 3	N/C
Pin 4	N/C

Accessories supplied: #80165-03 captive hex head screw; calibration data (level 2).

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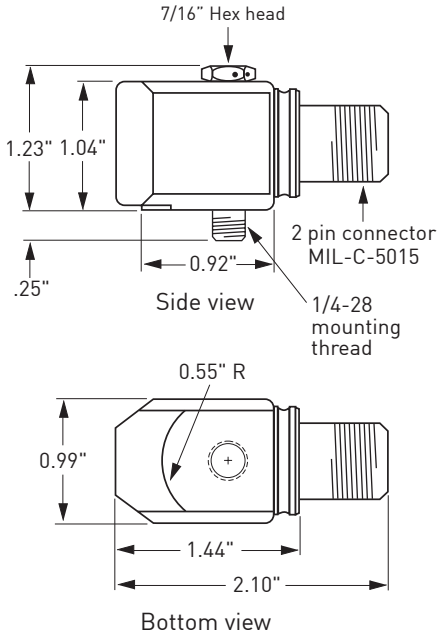
99004 Rev A 8/09

Model 787B
Low profile, general purpose accelerometer

Features
- Corrosion resistant
- Hermetic design
- Ground isolated
- ESD protection
- Reverse wiring protection
- Mounts in any orientation



Dynamic

Sensitivity, ±10%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response:	
±10%	1.0 - 5,000 Hz
±3 dB	0.7 - 10,000 Hz
Resonance frequency	22 kHz
Transverse sensitivity, max	5% of axial
Temperature response	–50°C –5% +120°C +5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g
Shock limit, min	5,000 g
Electromagnetic sensitivity, equiv. g, max	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max	0.002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	145 grams
Case material	316L stainless steel
Mounting	1/4 - 28 captive hex head screw with 0.046" diameter safety wire hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J10 / J9T2A

Connector pin	Function	Cable conductor color
Shell	ground	Shield
A	power/ signal	White
B	common	Black

Accessories supplied: #80165-01 captive hex head screw; calibration data (level 2).

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98988 Rev.A 12/08

Model 787F
Low profile, general purpose accelerometer

Features

- Corrosion resistant
- Hermetic design
- Ground isolated
- ESD protection
- EMI / RFI protection
- Reverse wiring protection
- Mounts in any orientation

Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response:	
±10%	1.0 - 5,000 Hz
±3 dB	0.7 - 10,000 Hz
Resonance frequency	22 kHz
Transverse sensitivity, max	5% of axial
Temperature response:	
–50°C	–5%
+120°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

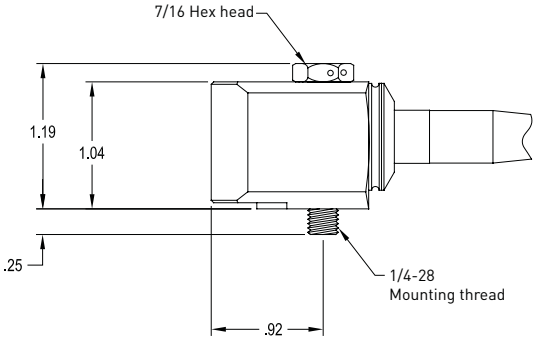
Environmental

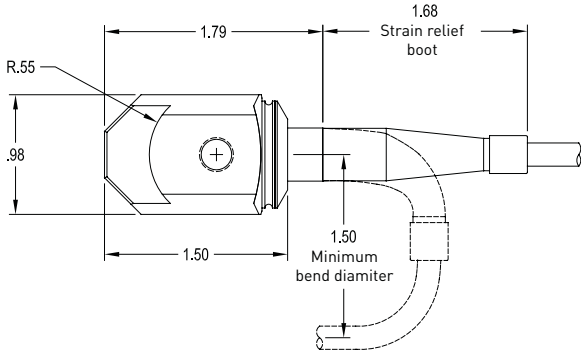
Temperature range	–50 to 120°C
Vibration limit	500 g
Shock limit, min	5,000 g
Electromagnetic sensitivity, equiv. g, max	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max	0.002 g/µstrain
Hydrostatic pressure	100 psi

Physical

Sensing element design	PZT ceramic / shear
Weight	145 grams
Case material	316L stainless steel
Mounting	1/4 - 28 captive hex head screw with 0.046" diameter safety wire hole
Integral cabling	J9T2A, 16 ft., blunt cut

Function	Cable conductor color
Case	shield
Power/ signal	white
Common	black





Accessories supplied: #80165-01 captive hex head screw; calibration data (level 2).

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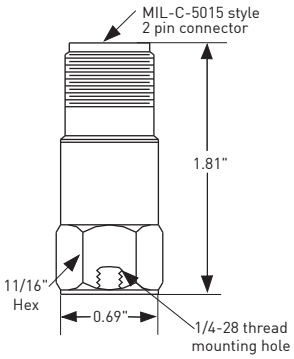
98958 Rev.B 1/08

Wilcoxon Research

Model 780A
General purpose accelerometer

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- Case isolated
- ESD protection
- Reverse wiring protection
- EMI / RFI shielded

Benefits
- Able to fit in small spaces
- Light weight for walk around programs
- Cross wiring will not harm sensor
- Prevents ground loops in permanent mount applications
- Can be hosed down or submersed with proper connector
- Magnet or permanent mount applications



Dynamic

Sensitivity, ±5%, 25°C		100 mV/g
Acceleration range		80 g peak
Amplitude nonlinearity		1%
Frequency response:		
	± 5%	1 - 7,000 Hz
	±10%	0.7 - 9,000 Hz
	± 3 dB	0.4 - 14,000Hz
Resonance frequency		30 kHz
Transverse sensitivity, max		5% of axial
Temperature response:		
	–50°C	–5%
	+120°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv g:		
Broadband	2.5 Hz to 25 kHz	500 µg
Spectral	10 Hz	7 µg/√Hz
	100 Hz	4 µg/√Hz
	1000 Hz	2 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv g, max	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max	0.0002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	62 grams
Case material	316L stainless steel
Mounting	1/4 - 28 UNF tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J10 / J9T2A

Connections

Connector pin	Function
Shell	ground
A	power/ signal
B	common

Note: Frequency response and spectral noise values are typical

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2)

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CE

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98957 Rev.A 7/09

Wilcoxon Research

Models 780B and 780C
Compact general purpose accelerometers

Dynamic

Sensitivity, 25°C		100 mV/g
Sensitivity tolerance:		
780B		±10%
780C		±15%
Acceleration range		80 g peak
Amplitude nonlinearity		1%
Frequency response:		
± 5%		1 - 7,000 Hz
±10%		0.7 - 9,000 Hz
± 3 dB		0.4 - 14,000Hz
Resonance frequency		30 kHz
Transverse sensitivity, max		5% of axial
Temperature effect on sensitivity:		
–50°C		–5%
+120°C		+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv g:		
Broadband	2.5 Hz to 25 kHz	500 µg
Spectral	10 Hz	7 µg/√Hz
	100 Hz	4 µg/√Hz
	1000 Hz	2 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv g, max	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max.	0.0002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	62 grams
Case material	316L stainless steel
Mounting	1/4 - 28 UNF tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type

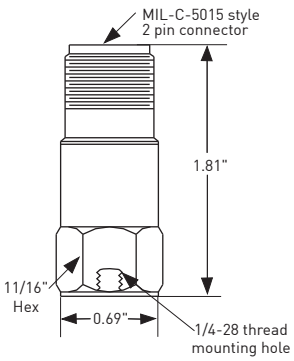
Connector pin	Function
Shell	ground
A	power/ signal
B	common

Note: Frequency response and spectral noise values are typical

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2)

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- Case isolated
- ESD protection
- Reverse wiring protection
- EMI / RFI shielded
- 780B option: 10% sensitivity tolerance
- 780C option: 15% sensitivity tolerance

Benefits
- Able to fit in small spaces
- Light weight for walk around programs
- Cross wiring will not harm sensor
- Prevents ground loops in permanent mount applications
- Can be hosed down or submersed with proper connector
- Magnet or permanent mount applications



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99014 Rev.A 7/09

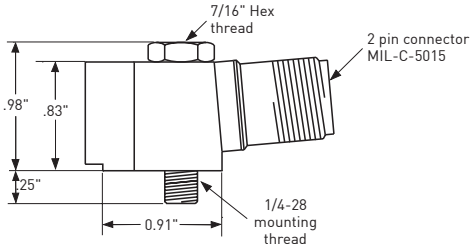
Model 785A
Low profile industrial accelerometer

Common applications

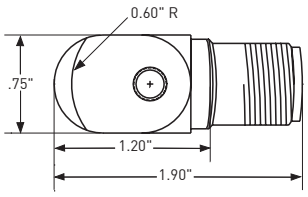
- General purpose
- Moderate industrial environments
- Conveyors and drives

Features

- Corrosion resistant
- Hermetic design
- Ground isolated
- ESD protection
- Reverse wiring protection
- RFI protection



Side view



Bottom view

Dynamic

Sensitivity, ±10%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response:	
±10%	2.0 - 8,000 Hz
±3 dB	1.0 - 12,000 Hz
Resonance frequency, mounted, min	30 kHz
Transverse sensitivity, max	5% of axial
Temperature response	–50°C –10% +120°C +7%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 kHz	1,260 µg
Spectral	10 Hz	11 µg/√Hz
	100 Hz	6 µg/√Hz
	1000 Hz	6 µg/√Hz
Output impedance		100 Ω
Bias output voltage, nominal		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g
Shock limit, min	5,000 g
Sealing	hermetic
Base strain sensitivity, max	0.002 g/µstrain

Physical

Weight	85 grams
Case material	316L stainless steel
Mounting	1/4 - 28 captive hex head screw with 0.046" diameter safety wire hole
Output connector	2 pin MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J10 / J9T2A

Connector pin	Function
Shell	case
A	power / signal
B	common

Notes: [1] **At 90 inch/lb. torque.**

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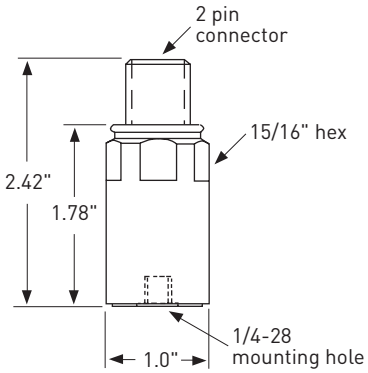
98709 Rev.A.2 6/07

Wilcoxon Research

Model 793R
Radiation resistant piezoelectric accelerometer

Features
- Corrosion-resistant
- Ground isolated
- Rugged design
- Hermetic seal
- ESD protection
- Miswiring protection
- Mounts in any condition
- Radiation rated



Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range[1]	50 g peak
Amplitude nonlinearity	1%
Frequency response:	
±5%	3 - 5,000 Hz
±10%	2 - 7,000 Hz
±3 dB	1 - 15,000 Hz
Resonance frequency, nominal	26 kHz
Transverse sensitivity, max.	5% of axial
Temperature response:	
-50°C	-5%
+120°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode[1]	2 - 10 mA
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage, nominal		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5000 g peak
Electromagnetic sensitivity, equiv. g	15 µg/gauss
Humidity limit	100% relative
Base strain sensitivity	0.004 g/µstrain
Radiation exposure limit	$1x10^7$ RADs

Physical

Weight	110 grams
Case material	stainless steel
Mounting	1/4-28 tapped hole
Output connector	2 Pin, MIL-C-5015 style
Mating connector	Wilcoxon R6
Recommended cable	J9T2 2-conductor shielded, Tefzel® jacket, 30pF/ft.

Connector	Function
A	power/signal
B	common

Notes: [1] A maximum current of 6 mA is recommended for operating temperatures in excess 100°C.

Accessories supplied: SF6 mounting stud; calibration data

Accessories available: Magnetic mounting bases, cementing studs, cable assembly R6Q-J9T2-XX, power supplies, amplifiers, signal conditioners

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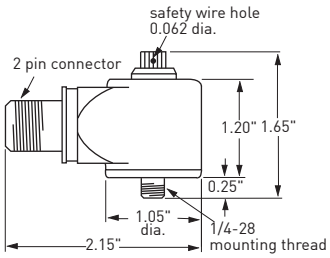
Model 797R
Premium, PiezoFET®, low profile IsoRing accelerometer, radiation resistant

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- Ground isolated
- ESD protection
- Miswiring protection
- Mounting in any orientation



Dynamic

Sensitivity, ±5%, 25°C		100 mV/g
Acceleration range		50 g peak
Amplitude nonlinearity		1%
Frequency response:		
±5%		3 - 5,000 Hz
±10%.		2 - 7,000 Hz
±3 dB		1 - 12,000 Hz
Resonance frequency		26 kHz
Transverse sensitivity, max		5 % of axial
Temperature response:		
–50°C		–5%
+120°C		+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	600 µg
Spectral	10 Hz	8 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g	30 µg/gauss
Sealing	Hermetic
Base strain sensitivity	0.002 g/µstrain
Radiation exposure limit	$1x10^7$ RADs

Physical

Sensing element design	PZT ceramic / shear
Weight	135 grams
Case material	316L stainless steel
Mounting	1/4-28 captive socket head screw
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J9T2

Connections

Connector	Function
A	power/signal
B	common

Accessories supplied: #12105-01captive socket head (metric studs available upon request); calibration data (level 3)

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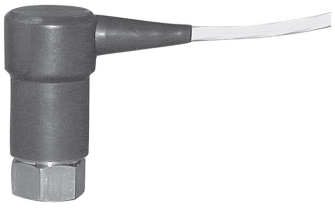
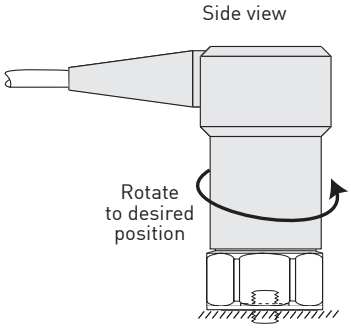
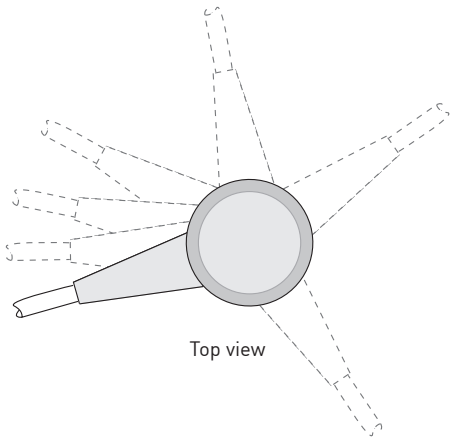
98925 Rev.A.2 02/07



Model 775A
Pivoting, low cost, stud mount accelerometer

Features:
- Rugged assembly
- Hermetic seal
- ESD protection
- Reverse wiring protection
- Pivoting cable connection





Dynamic

Sensitivity, ±20%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response, nominal:	
± 3 dB	24 CPM - 720,000 CPM (0.4 Hz - 12,000 Hz)
Resonance frequency, nominal	1,560 CPM (26 kHz)
Transverse sensitivity, max	5% of axial
Temperature response	–50°C –7% +80°C +5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated

Environmental

Temperature range	–50 to 80°C (–60 to 175°F)
Vibration limit	500 g
Shock limit, min	5,000 g
Sealing	hermetic

Physical

Sensing element design	PZT ceramic / shear
Weight	45 grams
Case material	316L stainless steel
Mounting	1/4 - 28 tapped hole
Cable type	J96, 16ft., blunt cut
Cable boot material	Viton®

Function	cable conductor color
Common	black
Power / signal	white
Shield	shield

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2).
Accessories available: SF8 cementing pad.

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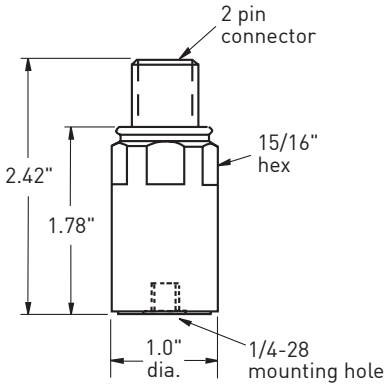
98761 Rev.A.3 12/07

Model 793L
Low frequency accelerometer

Features
- High sensitivity
- Ultra low-noise electronics for clear signals at very low vibration levels
- Low pass filtered to attenuate high frequencies
- Hermetic seal
- ESD protection
- Reverse wiring protection



Dynamic

Sensitivity, ±5%, 25°C		500 mV/g
Acceleration range		10 g peak
Amplitude nonlinearity		1%
Frequency response:		
–5%		0.6 - 700 Hz
–10%		0.4 - 1,000 Hz
–3 dB		0.2 - 2,300 Hz
Resonance frequency		15 kHz
Transverse sensitivity, max.		5% of axial
Temperature response:		
–50°C		–10%
+120°C		+10%

Electrical

Power requirements:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	8.0 µg
Spectral	2 Hz	2.0 µg/√Hz
	10 Hz	0.4 µg/√Hz
	100 Hz	0.2 µg/√Hz
Output impedance, max.		100Ω
Bias output voltage		10 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	250 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g.	20 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.0001 g/µstrain

Physical

Sensing element design	PZT ceramic / compression
Weight	142 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	power/ signal
B	common

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 3)
Options: Temperature sensor, intrinsic safety certification (consult factory)

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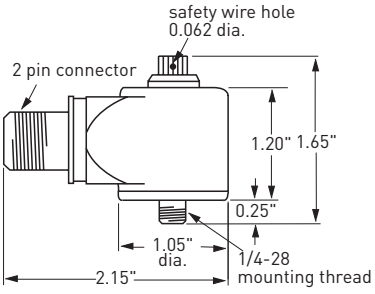
98191 Rev.G.3 12/07

Model 797L
Low profile, low frequency IsoRing® accelerometer

Features

- High sensitivity
- Ultra low-noise electronics for clear signals at very low vibration levels
- Low pass filtered to attenuate high frequencies
- Hermetic seal
- ESD protection
- Reverse wiring protection



Dynamic

Sensitivity, ±5%, 25°C		500 mV/g
Acceleration range		10 g peak
Amplitude nonlinearity		1%
Frequency response:		
–5%		0.6 - 850 Hz
–10%		0.4 - 1,500 Hz
–3 dB		0.2 - 3,700 Hz
Resonance frequency		18 kHz
Transverse sensitivity, max		7% of axial
Temperature response:		
–50°C		–8%
+120°C		+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	12 µg
Spectral	2 Hz	2.0 µg/√Hz
	10 Hz	0.6 µg/√Hz
	100 Hz	0.2 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		10 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	250 g peak
Shock limit	2,500 g peak
Electromagnetic sensitivity, equiv. g	5 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.001 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	148 grams
Case material	316L stainless steel
Mounting	1/4-28 captive socket head screw
Mating connector	R6 type
Recommended cabling	J9T2A

Connector pin	Function	Cable conductor color
shell	ground	shield
A	power/ signal	white
B	common	black

Accessories supplied: #12105-01 captive socket head (International customers specify mounting requirements); calibration data (level 3)
Options: Intrinsic safety certification (consult factory)

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98256 Rev.E 2/09

Model 799LF
Low frequency, filtered accelerometer

Features

- High sensitivity
- Ultra low-noise electronics for clear signals at very low vibration levels
- Opimized for 15V supply
- Low pass filtered to eliminate high frequencies
- Hermetic sealing
- ESD protection
- Reverse wiring protection

Dynamic

Sensitivity, ±5%, 25°C		500 mV/g
Acceleration range		10 g peak
Amplitude nonlinearity		1%
Frequency response:		
–5%		0.3 - 1,200 Hz
–10%		0.2 - 1,600 Hz
–3 dB		0.1 - 2,500 Hz
Resonance frequency		18 kHz
Transverse sensitivity, max		5% of axial
Temperature response:		
–50°C		–7%
+120°C		+0%

Electrical

Power requirement:	voltage source	15 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Spectral	0.10 Hz	15 µg/√Hz
	1 Hz	3 µg/√Hz
	10 Hz	1 µg/√Hz
	100 Hz	1 µg/√Hz
Output impedance, max		400 Ω
Bias output voltage		8.0 VDC
Grounding		case isolated, internally shielded

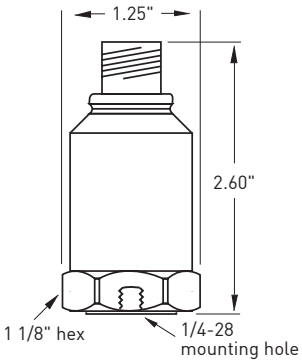
Environmental

Temperature range	–50 to 120°C
Vibration limit	250 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g	150 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.0005 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	205 grams
Case material	316L stainless steel
Mounting	1/4-28 tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type

Connector pin	Function
Shell	ground
A	power/ signal
B	common



Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 3)

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98270 Rev.2.3 12/07

Wilcoxon Research

Model 786-500
General purpose low frequency accelerometer

Dynamic

Sensitivity, ±5%, 25°C		500 mV/g
Acceleration range		10 g peak
Amplitude nonlinearity		1%
Frequency response:		
± 5%		0.7 - 5,000 Hz
±10%		0.5 - 9,000 Hz
± 3 dB		0.2 - 14,000 Hz
Resonance frequency		30 kHz
Transverse sensitivity, max		5% of axial
Temperature response:		
–50°C		–5%
+120°C		+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv g:		
Broadband	2.5 Hz to 25 kHz	250 µg
Spectral	10 Hz	2.5 µg/√Hz
	100 Hz	1.5 µg/√Hz
	1000 Hz	1.5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv g, max	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max	0.0002 g/µstrain

Physical

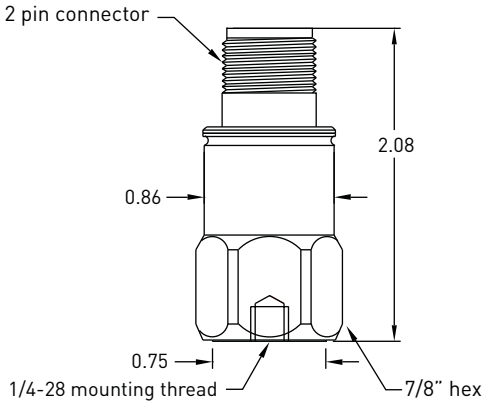
Sensing element design	PZT ceramic / shear
Weight	90 grams
Case material	316L stainless steel
Mounting	1/4 - 28 UNF tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J10 / J9T2A

Connections

Connector pin	Function
Shell	ground
A	power/ signal
B	common

Features
- Rugged design
- High sensitivity
- Hermetic seal
- Case isolated
- ESD protection
- Reverse wiring protection
- EMI / RFI shielded

Benefits
- Clear signals at low vibration levels
- Extended low end frequency response
- Improved signal to noise ratio versus other general purpose accelerometers
- A single sensor can detect both low and high speed vibrations
- Optimized to detect vibration on slow turning machinery like cooling tower fans and slow speed gearboxes



Note: Frequency response limits spectral and noise values are typical

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2)

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98960 Rev.A 6/08

Model 799M
Low frequency, high sensitivity, filtered accelerometer

Features

- High sensitivity
- Ultra low-noise electronics for clear signals at very low vibration levels
- Optimized for 15V supply
- Low pass filtered to eliminate high frequencies
- Hermetic seal
- ESD protection
- Reverse wiring protection

Dynamic

Sensitivity, ±5%, 25°C	1,000 mV/g
Acceleration range	5 g peak
Amplitude nonlinearity	1%
Frequency response:	
–5%	0.6 - 1,200 Hz
–10%	0.4 - 1,600 Hz
–3 dB	0.2 - 2,500 Hz
Resonance frequency	18 kHz
Transverse sensitivity, max	5% of axial
Temperature response	
–50°C	–7%
+80°C	+5%

Electrical

Power requirement:	voltage source	15 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Spectral	0.10 Hz	15 µg/√Hz
	1 Hz	3 µg/√Hz
	10 Hz	1 µg/√Hz
	100 Hz	1 µg/√Hz
Output impedance, max		400 Ω
Bias output voltage		8.0 VDC
Grounding		case isolated, internally shielded

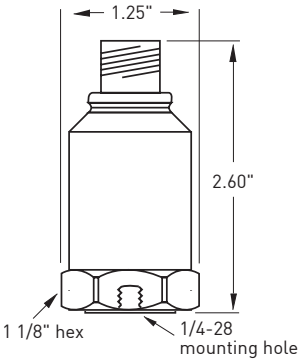
Environmental

Temperature range	–50 to 80°C
Vibration limit	250 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g	150 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.0005 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	205 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	power/ signal
B	common



Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 3)

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98271 Rev.2.4 12/07

Model 712F
High frequency, integral cable accelerometer

Features

- Corrosion resistant
- Hermetically sealed
- Ground isolated
- ESD protection
- Reverse wiring protection
- EMI/RFI protection

Dynamic

Sensitivity, ±10% @25°C	100 mV/g
Acceleration range	60 g peak
Amplitude nonlinearity	1%
Frequency response:	
±5%	9.0 - 15,000 Hz
±10%	6.0 - 20,000 Hz
±3 dB	3.0 - 25,000 Hz
Resonance frequency, mounted	›45 kHz
Transverse sensitivity, max	3% of axial
Temperature response:	
–50°C	–10%
+120°C	+10%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 kHz	1,000 µg
Spectral	10 Hz	25 µg/√Hz
	100 Hz	10 µg/√Hz
	1000 Hz	8 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage, nominal		12 VDC
Grounding		case isolated, internally shielded

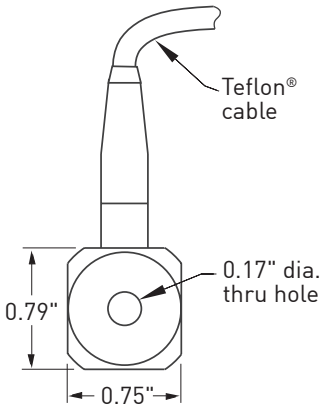
Environmental

Temperature range	–50 to 120°C
Vibration limit	±1,000 g
Shock limit, max.	5,000 g peak
Sealing	hermetic
Base strain sensitivity, max	0.03 g/µstrain

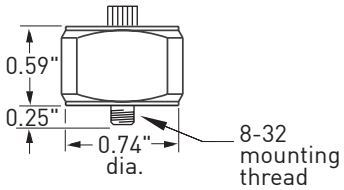
Physical

Sensing element design	PZT ceramic / shear
Weight	35 grams
Case material	316L stainless steel
Mounting	8-32 captive screw with 0.047" diameter safety wire hole
Mating connector	N/A
Integral cabling	J9T2A, 16 ft. blunt cut

Top view



Side view



712F	Function
White	power / signal
Black	common
Shield	case

Accessories supplied: 8-32 captive screw; calibration data (level 2)

Accessories available: M4 captive screw

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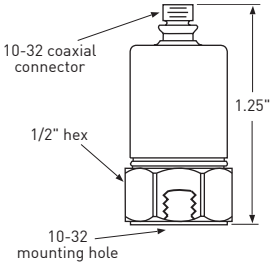
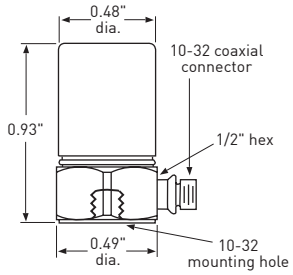
98737 Rev.A.3 12/07

Model 732A/732AT
High frequency accelerometer

Features
- Wide dynamic range
- Compact construction to fit in tight spaces
- Wide frequency range



Model 732AT



Model 732A

Dynamic

Sensitivity, ±5%, 25°C	10 mV/g
Acceleration range	500 g peak
Amplitude nonlinearity	1%
Frequency response	
±5%	2.0 - 15,000 Hz
±3 dB	0.5 - 25,000 Hz
Resonance frequency	60 kHz
Transverse sensitivity, max.	7% of axial
Temperature response:	
–50°C	–10%
+120°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	200 µg
Spectral	10 Hz	20 µg/√Hz
	100 Hz	3 µg/√Hz
	1,000 Hz	2 µg/√Hz
	10,000 Hz	2 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage		10 VDC
Grounding		case grounded

Environmental

Temperature range	–50°C to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g	100 µg/gauss
Base strain sensitivity	0.005 g/µstrain

Physical

Sensing element design	PZT ceramic / compression
Weight	13 grams
Material	316L stainless steel
Mounting	10-32 tapped hole
Output connector	10-32 coaxial
Mating connector	R1
Recommended cabling	J93

Connector Pin	Function	Cable conductor
Shell	common	shield
Pin	power / signal	center

Accessories supplied: SF1 mounting stud (International customers specify mounting requirements); calibration data (level 3).

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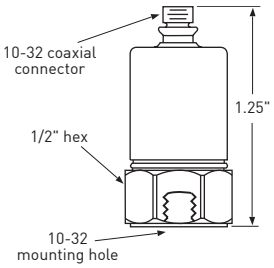
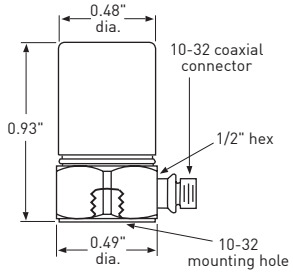
98084 Rev.D.3 12/07

Model 736/736T
Compact, high sensitivity, high frequency accelerometer

Features
- Wide dynamic range
- Compact construction to fit in tight spaces
- Wide frequency range



Model 736T



Model 736

Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range	50 g peak
Amplitude nonlinearity	1%
Frequency response:	
±5%	5.0 - 15,000 Hz
±3 dB	2.0 - 25,000 Hz
Resonance frequency	60 kHz
Transverse sensitivity, max.	7% of axial
Temperature response:	
–50°C	–10%
+120°C	+5%

Electrical

Power Requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	150 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	2 µg/√Hz
	1,000 Hz	1 µg/√Hz
	10,000 Hz	0.8 µg/√Hz
Output impedance, max.		150 Ω
Bias output voltage		10 VDC
Grounding		case grounded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagneticsensitivity, equiv. g	100 µg/gauss
Base strain sensitivity	0.005 g/µstrain

Physical

Sensing element design	PZT ceramic / compression
Weight	13 grams
Material	316L stainless steel
Mounting	10-32 tapped hole
Output connector	10-32 coaxial
Mating connector	R1
Recommended cabling	J93

Connector Pin	Function	Cable conductor
Shell	common	shield
Pin	power / signal	center

Accessories supplied: SF1 mounting stud (International customers specify mounting requirements); calibration data (level 3).

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98093 Rev.D.3 12/07

Model 997 Series
High frequency, ring type accelerometer

Features

- Corrosion resistant
- Hermetically sealed
- Ground isolated
- ESD protection
- Reverse wiring protection
- EMI/RFI protection

Dynamic

Sensitivity, ±10% @25°C	10 mV/g
Acceleration range	600 g peak
Amplitude nonlinearity	1%
Frequency response:	
5%	1.5 - 20,000 Hz
10%	1.0 - 25,000 Hz
±3 dB	0.5 - 29,000 Hz
Resonance frequency, mounted	›45 kHz
Transverse sensitivity, max	‹3% of axial
Temperature response:	
–50°C	–10%
+125°C	+10%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 kHz	1,000 µg
Spectral	10 Hz	25 µg/√Hz
	100 Hz	9 µg/√Hz
	1000 Hz	7 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage, nominal		12 VDC
Grounding		case isolated, internally shielded

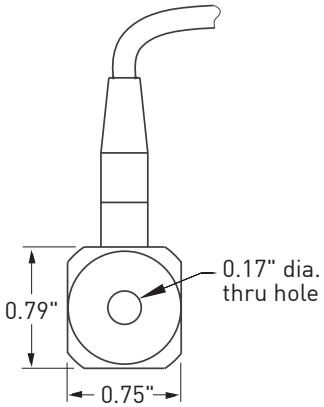
Environmental

Temperature range	–50 to 125°C
Vibration limit	±1,000 g
Shock limit, max.	5,000 g peak
Sealing	Hermetic
Base strain sensitivity, max	0.03 g/µstrain

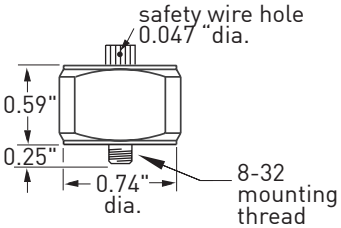
Physical

Weight	35 grams
Case material	316L stainless steel
Mounting	8-32 captive screw
Integral cabling	J10, 16 ft. integral cable, Enviroprene™, two conductor shielded

Top view



Side view



Function	997
Power / signal	white
Common	black
Case	shield

Accessories supplied: 8-32 captive screw; calibration data (level 2)

Accessories available: M4 captive screw

Options: Cable length, connector

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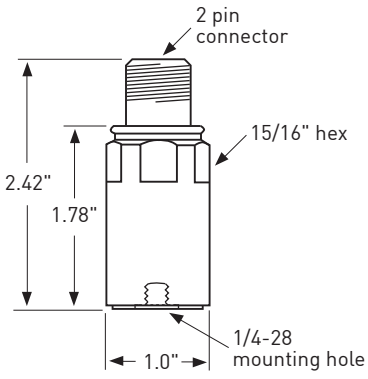
98570 Rev.A.4 12/07

Model 793V Series
Piezoelectric velocity transducers

Features:

- Intrinsic safety certified (options for Model 793V, consult factory)
- Industrial ruggedness
- Eliminates distortion caused by high frequency signals
- Corrosion-resistant
- Internally integrated to velocity
- Ultra low-noise electronics for clear signals at very low vibration levels
- Reverse wiring protection



Models	793V	793V-5	Units
Dynamic			
Sensitivity, ±10%, 25°C	100	500	mV/in/sec
Velocity range	50	10	in/sec peak
Amplitude nonlinearity	2.5%	5%	
Frequency response:			
±10%	3.0 - 3,500	8.0 - 3,500	Hz
±3 dB	2.5 - 7,000	5.0 - 7,000	Hz
Resonance frequency, mounted, nom	15	15	kHz
Transverse sensitivity, max.	5% of axial	5% of axial	
Temperature response			
–50°C	–5%	–5%	
+80°C	+3%	+3%	
+120°C	–5%	–5%	
Electrical			
Power requirement: voltage source	18 - 30	18 - 30	VDC
current regulating diode	2 - 10	2 - 10	mA
Electrical noise, equiv. in/sec, nominal:			
Broadband 2.5 Hz to 25 kHz	100	40	µin/sec
Spectral 10 Hz	10	4.0	µin/sec/√Hz
100 Hz	1.0	0.4	µin/sec/√Hz
1000 Hz	0.2	0.05	µin/sec/√Hz
Absolute phase shift, nom. the greater of:	$\tan^{-1}$ 2/f or 2°	$\tan^{-1}$ 5/f or 2°	
Output impedance, nominal 4mA supply, the greater of:	5,000 or 200	25,000 or 200	/f Ω
Bias output voltage, nominal	10	10	VDC
Grounding	case isolated, internally shielded	case isolated, internally shielded	
Environmental			
Temperature range	–50 to 120°C	–50 to 120°C	
Vibration limit	250	250	g peak
Shock limit	2,500	2,500	g peak
Electromagnetic sensitivity, equiv. in/sec	25	25	µin/sec/gauss
Sealing	hermetic	hermetic	
Base strain sensitivity	0.0005	0.0005	in/sec/µstrain
Physical			
Weight	145 grams	145 grams	
Case material	316L stainless steel	316L stainless steel	
Mounting	1/4 - 28 tapped hole	1/4 - 28 tapped hole	
Output connector	MIL-C-5015, 2-pin style	MIL-C-5015, 2-pin style	
Connections			
Pin A	signal, power	signal, power	
Pin B	common	common	
Mating connector	R6 (Amphenol 97-3106A-10SL-4S)		
Recommended cable	J9T2		

Options: Intrinsic safety certifications for model 793V; stainless steel flexible hose; temperature sensor (793VT).

Accessories supplied: SF6 mounting stud, calibration data.

Optional safety approvals

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98219 Rev.J.1 8/09

Notes: [1] A maximum current of 6 mA is recommended for operating temperatures in excess of 100 °C.
Options: Intrinsic safety certifications for model 793V; stainless steel flexible hose; temperature sensor (793VT), customer specified sensitivity, low frequency filtering, cable length, connector.
Accessories supplied: SF6 mounting stud, calibration data.
Accessories available: R6SL-J9T2-XX splash-proof cable assembly, magnetic mounting bases, SF8 cementing studs, power supplies, amplifiers, signal conditioners.

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Model 797V
Low profile, IsoRing® PiezoVelocity transducer PVT™

Dynamic

Sensitivity, ±10%, 25°C		100 mV/in/sec
Velocity range		50 in/sec peak
Amplitude nonlinearity		5%
Frequency response:		
±10%		2.0 - 3,500 Hz
±3 dB		1.6 - 7,000 Hz
Resonance frequency		18 kHz
Transverse sensitivity, max		5% of axial
Temperature response		–50°C –15% +120°C +10%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. in/sec:		
Broadband	2.5 Hz to 25 kHz	100 µin/sec
Spectral	10 Hz	10 µin/sec
	100 Hz	0.8 µin/sec
	1000 Hz	0.1 µin/sec
Output impedance, 4mA supply, the greater of		5,000/f or 200Ω
Bias output voltage		10 VDC
Grounding		case isolated, internally shielded

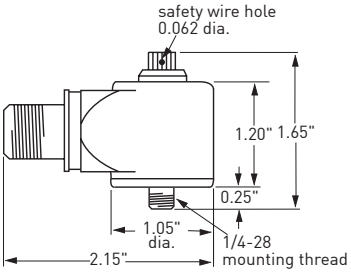
Environmental

Temperature range	–50 to 120°C
Vibration limit	250 g peak
Shock limit	2,500 g peak
Electromagnetic sensitivity, equiv. in/sec	50 µin/sec/gauss
Sealing	hermetic
Base strain sensitivity	0.004 in/sec/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	148 grams
Case material	316L stainless steel
Mounting	1/4-28 captive socket head screw
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cable	J9T2A

Features
- Rugged design
- Internally integrated to velocity
- Eliminates distortion caused by high frequency signals
- Corrosion resistant
- ESD protection
- Reverse wiring protection
- Mounts in any orientation



Connector pin	Function
Shell	ground
A	power/ signal
B	common

Accessories supplied: #12105-01 captive socket head (International customers specify mounting requirements); calibration data (level 3)
Options: Intrinsic safety certifications (consult factory)

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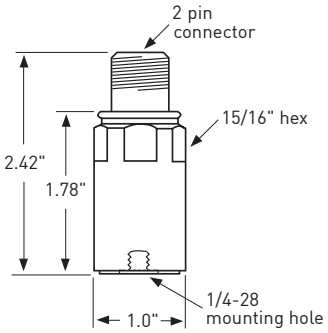
98265 Rev.A.5 12/07

Model 793VR
Radiation resistant piezoelectric velocity transducers

Features
- Rugged design
- Eliminates distortion caused by high frequency signals
- Corrosion-resistant
- ESD protection
- Internally integrated to velocity
- Ultra low-noise electronics for clear signals at very low vibration levels
- Corrosion-resistant
- Ground isolated
- Hermetic seal
- Miswiring protection
- Radiation rated



Dynamic

Sensitivity, ±10 %, 25 °C	100 mV/in/sec
Velocity range	50 in/sec/peak
Amplitude nonlinearity	2.5%
Frequency response:	
±10 %	2.5 - 3500 Hz
±3 dB	2.0 - 7000 Hz
Resonance frequency, mounted, nominal	15 kHz
Transverse sensitivity, max.	5% of axial
Temperature response:	
-50°C	-5%
+120°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode[1]	2 - 10 mA
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 kHz	100 µin/sec
Spectral	10 Hz	10 µin/sec√Hz
	100 Hz	1.0 µin/sec√Hz
	1000 Hz	0.2 µin/sec√Hz
Absolute phase shift, nominal, the greater of:		$\tan^{-1}$ 2/f or 2°
Output impedance, nominal, 4mA supply, the greater of		5000/f or 20Ω
Bias output voltage, nominal		10 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	-50 to 120°C
Vibration limit	250 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g.	25 µin/sec/gauss
Base strain sensitivity	0.001 in/sec/µstrain
Radiation exposure limit	$1x10^7$ RADs

Physical

Weight	133 grams
Case material	stainless steel
Mounting	1/4 - 28 tapped hole
Output connector	MIL-C-5015 style, 2 pin
Mating connector	R6
Recommended cable	J9T2

Connector	Function
Pin A	signal, power
Pin B	common

Notes: [1] A maximum current of 6 mA is recommended for operating temperatures in excess of 100 °C

Accessories supplied: SF6 mounting stud; calibration data

Accessories available: R6SL series cable assembly, magnetic mounting bases, cementing studs, power supplies, amplifiers, signal conditioners

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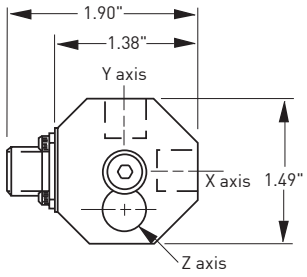
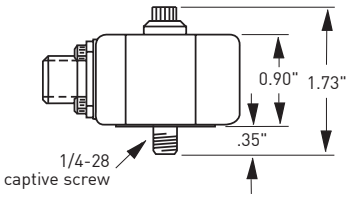
98226 Rev. A.3 12/07

Model 993A
General purpose, triaxial accelerometer

Features
- Rugged design
- Easy to mount



Top view



Side View

Dynamic

Sensitivity, ±10%, 25°C	100 mV/g
Acceleration range	50 g peak
Amplitude nonlinearity	1%
Frequency response:	
all channels, ±10%	2 - 2,000 Hz
Transverse sensitivity, max.	5% of axial
Temperature response:	
–50°C	+10%
+25°C	+0%
+80°C	+3%
–120°C	–7%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	150 µg
Spectral	10 Hz	20 µg/√Hz
	100 Hz	2 µg/√Hz
	1000 Hz	0.6 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g.	100 µg/gauss
Sealing	Epoxy
Base strain sensitivity	0.0005 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	88 grams
Case material	hardcoated aluminum
Mounting	1/4-28 captive socket head screw
Output connector	4 pin, Bendix PC02A-8-4P
Mating connector	R9W
Recommended cabling	J9T4

Connector pin	Function
Shell	N/C
A	axis Y, power / signal
B	axis X, power / signal
C	axis Z, power / signal
D	common (all channels)

Accessories supplied: #11714-09 captive screw (International customers specify mounting requirements); calibration data (level 2)

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MEGGiTT
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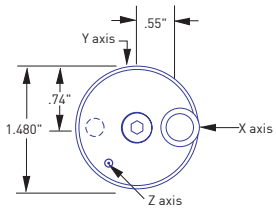
Model 993B Series
General purpose, hermetic triaxial accelerometer

Features
- Rugged hermetic design
- General purpose
- Broad frequency response
- Easy to mount
- EMI/RFI protection
- ESD protection
- Reverse wire protection
- Low noise
- Low weight
- Armor jacketed cable

	993B-5	993B-6	993B-7
Dynamic			
Sensitivity, ±10%, 25°C	25 mV/g	50 mV/g	100 mV/g
Acceleration range	160 g peak	80 g peak	40 g peak
Amplitude nonlinearity	1%	-	-
Frequency response[1]:			
Z Axis ±3 dB	2 - 10,000 Hz	-	-
X & Y axis ±3 dB	2 - 7,000 Hz	-	-
Transverse sensitivity, max.	7% of axial	-	-
Electrical			
Power Requirement: voltage source	18 - 30 VDC	-	-
current regulating diode	2 - 5 mA	-	-
Electrical noise, equiv. g, nominal:			
Broadband 2.5 Hz to 25 kHz	336 µg	220 µg	160 µg
Spectral 10 Hz	24 µg/√Hz	15 µg/√Hz	10 µg/√Hz
100 Hz	3.2 µg/√Hz	2.0 µg/√Hz	1.4 µg/√Hz
1000 Hz	2 µg/√Hz	1.1 µg/√Hz	1.0 µg/√Hz
Output impedance, max.	400 Ω	-	-
Bias output voltage	11 VDC	-	-
Grounding	case isolated, internally shielded		
Turn-on time	‹ 1 sec	-	-
Environmetal			
Temperature range	-50 to120°C	-	-
Vibration limit	500 g peak	-	-
Shock limit	5,000 g peak	-	-
Electromagnetic sensitivity, equiv.g.	100µg/gauss	-	-
Sealing	hermetic	-	-
Base strain sensitivity, max.	0.0005 g/µstrain	-	-
Hydrostatic pressure, max	100 psi (IP68)	-	-
Physical			
Weight (excluding cable)	134 grams	-	-
Case material	316L stainless steel	-	-
Cable	Intergral, 16 Ft Teflon® J9T4B, Armored		
Mounting	10-32 captive screw	-	-

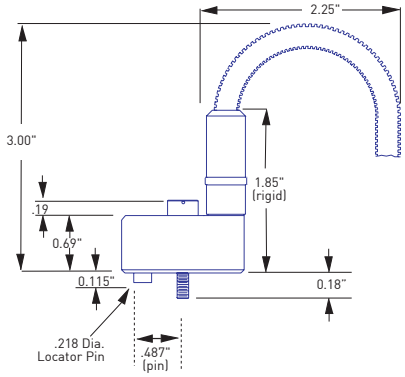


Function	Cable conductor color
Axis x, power / signal	green
Axis y, power / signal	red
Axis z, power / signal	white
Common (all channels)	black
N/C	shield

Notes: [1] As measured using the mounting screw.

Options: M6-1 captive screw

Accessories supplied: Captive screw, calibration data.



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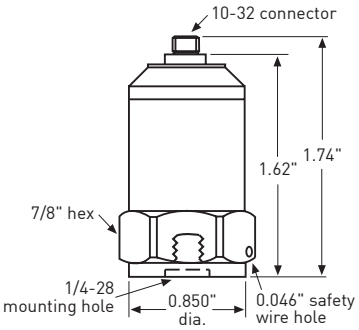
98872 Rev.B 01/08

Model 376
High temperature accelerometer

Features
- Industrial ruggedness
- Charge output
- Ground isolated
- 260°C operation



Dynamic

Sensitivity, 25°C, nominal	25 pC/g
Amplitude nonlinearity, to 250 g	1%
Frequency response:	
±5%	6,000 Hz
±10%	8,000 Hz
±3 dB	12,000 Hz
Resonance frequency	30 kHz
Transverse sensitivity, max.	7% of axial
Temperature response:	
–50°C	+10%
+260°C	+20%

Electrical

Capacitance	500 pF
Resistance, min.	1,000 MΩ
Grounding	case isolated

Environmental

Temperature range	–50 to 260°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Sealing	welded
Base strain sensitivity	0.002 g/µstrain
Humidity limit	100% relative

Physical

Sensing element design	PZT ceramic / compression
Weight	75 grams
Case material	stainless steel
Mounting	1/4 - 28 tapped hole
Output connector	10-32 coaxial
Mating connector	R1
Recommended cabling	J3

Connector pin	Function
Shell	crystal, positive
Pin	crystal, negative

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 3)

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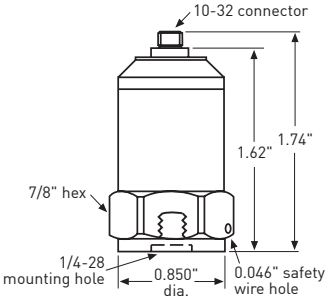
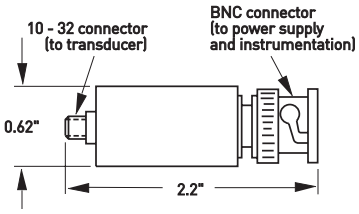
98013 Rev.D.2 12/07

Model 376/CC701HT system
Accelerometer/charge amplifier system

Features
- Industrial ruggedness
- Charge output
- Ground isolated
- 260°C operation



Model 376



Model CC701HT

Dynamic

Sensitivity, 25°C		100 mV/g, ±10%
Acceleration range		50 g
Amplitude linearity, to 50 g		1%
Frequency response:		
±10%		2 - 10,000 Hz
±3 dB		1 - 15,000 Hz
Resonance frequency		30 kHz
Transverse sensitivity		7% of axial
Temperature response:		
–50°C		–10%
+260°C		+20%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband		0.001 g peak
Output impedance		‹100Ω
Bias output voltage		12 VDC
Grounding		case isolated

Enivironmental

Temperature range:	
376	–50 to 260°C
CC701HT	–40 to 100°C
Vibration limit	500 g peak
Shock limit	5000 g peak
Base strain	0.002 g/µstrain

Physical

Sensing element design	PZT ceramic / compression
Weight:	
376	75 grams
CC701HT	40 grams
Case material	316L stainless steel
Mounting	1/4-28 tapped hole
Mating connector	BNC jack
Standard cabling[1]	R1-1-J3-12

Connector pin	Function
Shell	common
Pin	power / signal

Notes: [1] Other cable lengths are available
Accessories supplied: Calibration data (level 3)

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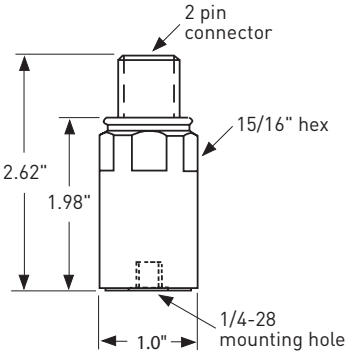
98603 Rev.A.2 5/07

FireFET® Model 793-6
High temperature, general purpose accelerometer

Features
- High temperature operation
- Rugged design
- Corrosion resistant
- Hermetically sealed
- Ground isolated
- ESD protection
- Reverse wiring protection
- 150°C operation



Dynamic

Sensitivity, ±10%, 25°C	100 mV/g
Acceleration range	50 g peak
Amplitude nonlinearity	1%
Frequency response:	
±5%	4 - 5,000 Hz
±10%	3 - 7,000 Hz
±3dB	1 - 12,000 Hz
Resonance frequency	20 kHz
Transverse sensitivity, max	5% of axial
Temperature response:	
–50°C	–5%
+0°C	+2%
+150°C	-5%

Electrical

Power requirement:	voltage source	18 - 30 VDC	
	current regulating diode	2 - 4 mA	
Electrical noise, equiv. g, (µg/√Hz):			
Broadband	2.5 Hz to 25 kHz	0.3 mg	
		25°C	150°C
Spectral at	10 Hz	10	30
	100 Hz	3	10
	1,000 Hz	2	6
Output impedance, max		100 Ω	
Bias output voltage:			
at 25°C		12 VDC	
at 150°C		11 VDC	
Grounding		case isolated, internally shielded	

Environmental

Temperature range (mounting surface)	–50 to 150°C
Vibration limit	500 g peak
Shock limit	2,500 g peak
Electromagnetic sensitivity, equiv. g	15 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.0005 g/µstrain

Physical

Sensing element design	PZT ceramic / compression
Weight	135 grams
Case material	316L stainless steel
Mounting	1/4 - 28 tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type

Connector Pin	Function	Cable conductor
Shell	ground	shield
A	power/ signal	white
B	common	black

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 3).

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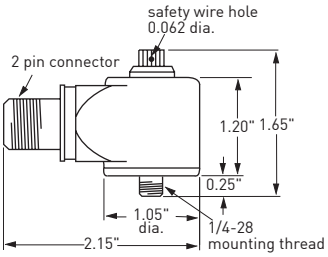
98181 Rev.E.3 12/07

FireFET® Model 797-6
High temperature, low profile, general purpose accelerometer

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- Ground isolated
- ESD protection
- Reverse wiring protection
- Mounts in any orientation
- 150°C operation



Dynamic

Sensitivity, ±10%, 25°C		100 mV/g
Acceleration range		50 g peak
Amplitude nonlinearity		1%
Frequency response:		
±5%		4 - 5,000 Hz
±10%.		3 - 7,000 Hz
±3 dB		1.0 - 11,000 Hz
Resonance frequency		20 kHz
Transverse sensitivity, max		5% of axial
Temperature response:		
–50°C		–5%
+0°C		+2%
+150°C		–5%

Electrical

Power requirement:	voltage source		18 - 30 VDC
	current regulating diode		2 - 4 mA
Electrical noise, equiv. g:			
Broadband	2.5 Hz to 25 kHz		0.3 mg
		25°C	150°C
Spectral at (µg/√Hz):			
	10 Hz	10	30
	100 Hz	3	10
	1,000 Hz	2	6
Output impedance, max			100 Ω
Bias output voltage:			
at 25°C			12 VDC
at 150°C			11 VDC
Grounding			case isolated, internally shielded

Environmental

Temperature range	–50 to 150°C
Vibration limit	500 g peak
Shock limit	2,500 g peak
Electromagnetic sensitivity, equiv. g	5 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.001 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	145 grams
Case material	316L stainless steel
Mounting	1/4-28 captive socket head screw
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type

Connector pin	Function
Shell	ground
A	power/ signal
B	common

Accessories supplied: 1/4 - 28 captive screw (International customers specify mounting requirements); calibration data (level 3).

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98251 Rev.B.3 012/07

Model PC420A Series - RMS and peak Acceleration loop powered sensors (LPS™)

Features
- True RMS or calculated peak output
- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection

Benefits
- Choice of output: RMS or peak, permits you to choose the sensor that best fits your industrial requirements
- 24/7 output of overall machine vibration for trending in PLC
- Helps guide maintenancein prioritizing need for service
- Alerts users of changing machine condition

The 4-20 mA output of the PC420A Series is proportional to acceleration vibration. An output of 4 mA indicates a level of 0 g or no vibration present. A full-scale reading of 20 mA indicates that the maximum range (RMS or peak) of vibration is present.

Output, 4-20 mA

Full scale, 20 mA (±5%)	see table 1 on back
Frequency response:	
±10%	10 Hz - 1.0 kHz
±3 dB	1 Hz - 2.0 kHz
Repeatability	±2%
Transverse sensitivity, max.	5%

Electrical

Power requirements (two wire loop power):	
Voltage at PC420 Series sensor terminals	10 VDC min, 30 VDC max
Loop resistance at 24 VDC, maximum	700Ω
Turn on time, 4-20 mA loop	‹ 30 seconds
Grounding	case isolated, internally shielded

Environmental

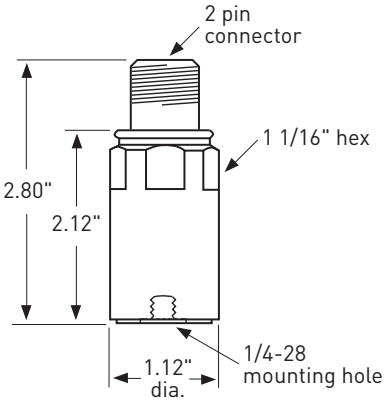
Operating temperature range[1]	–40 to 105°C
Vibration limit	250 g peak
Shock limit	2,500 g peak
Sealing	hermetic

Physical

Sensing element design	PZT ceramic / shear
Weight	160 grams
Case material	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	loop positive (+)
B	loop negative (–)

Notes: [1] 105°C operating temperature applies to units shipped after July 1, 2009, and with serial numbers greater than 50000.
Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2).



CE

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99010 Rev.A 6/09

Table 1: PC420Ax-yy model number selection

x (4-20 mA output type)	yy (4-20 mA full scale)
R = RMS output, acceleration	05 = 5 g
P = Calculated peak output, acceleration	10 = 10 g
	20 = 20 g
	50 = 50 g

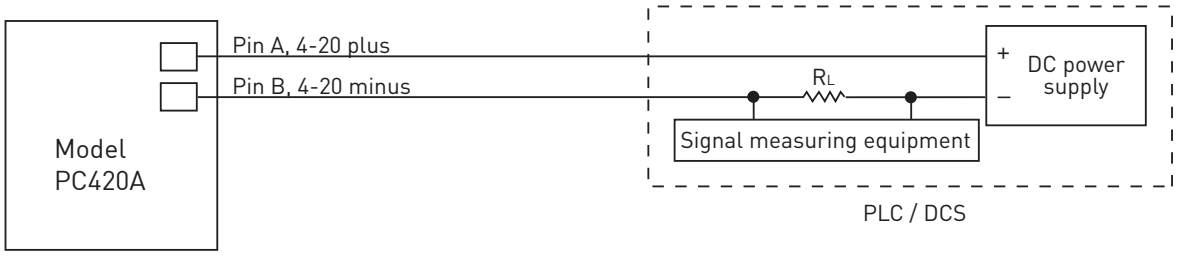
Notes: [1] Maximum loop resistance (R_L) can be calculated by:

$$R_L \text{ (max resistance)} = \frac{V_{DC\ power} - 10\ V}{20\ mA}$$

DC Supply Voltage	R_L (max resistance)[2]	R_L (minimum wattage capability)[3]
12 VDC	100Ω	1/8 Watt
20 VDC	500Ω	1/4 Watt
24 VDC	700Ω	1/2 Watt
26 VDC	800Ω	1/2 Watt
30 VDC	1.0kΩ	1/2 Watt

[2] Lower resistance is allowed, greater than 10Ω recommended.
[3] Minimum R_L wattage determined by: (0.0004 x R_L).

Typical circuit



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Model PC420ATP Series - true peak Acceleration loop powered sensors (LPS™)

Features
- True peak output
- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection

Benefits
- 24/7 output of true peak acceleration machine vibration for trending in PLC
- True peak is useful for detecting looseness, valves, rod knock and piston slap on reciprocating machinery
- Helps guide maintenance in prioritizing need for service
- Alerts users of changing machine condition

The 4-20 mA output of the PC420ATP Series is proportional to true peak acceleration vibration. An output of 4 mA indicates a level of 0 g or no vibration present. A full-scale reading of 20 mA indicates that the maximum range of vibration is present.

Output, 4-20 mA

Full scale, 20 mA (±5%)	see table 1 on back
Frequency response:	
±10%	10 Hz - 1.0 kHz
±3 dB	4 Hz - 2 kHz
Repeatability	±2%
Transverse sensitivity, max.	5%

Electrical

Power requirements (two wire loop power):	
Voltage at PC420 Series sensor terminals	10 VDC min, 30 VDC max
Loop resistance[1] at 24 VDC, maximum	700Ω
Turn on time, 4-20 mA loop	‹ 30 seconds
Grounding	case isolated, internally shielded

Environmental

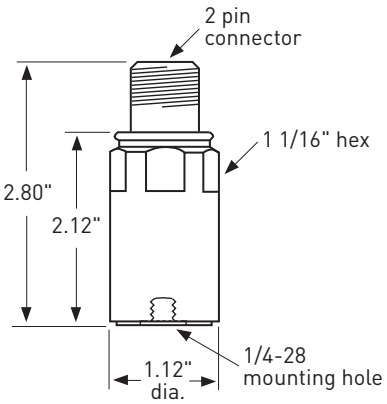
Temperature range	–40 to 85°C
Vibration limit	250 g peak
Shock limit	2,500 g peak
Sealing	hermetic

Physical

Sensing element design	PZT ceramic / shear
Weight	162 grams
Case material	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	loop positive (+)
B	loop negative (–)

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2).



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98819 Rev.B 6/09

Table 1: PC420ATP-yy model number selection

yy (4-20 mA full scale)
05 = 5 g
10 = 10 g
20 = 20 g

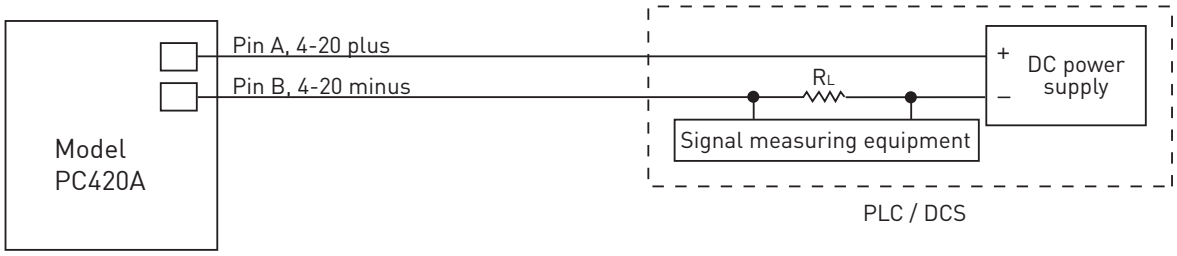
Notes: [1] Maximum loop resistance (R_L) can be calculated by:

$$R_L \text{ (max resistance)} = \frac{V_{DC\ power} - 10\ V}{20\ mA}$$

DC Supply Voltage	R_L (max resistance)[2]	R_L (minimum wattage capability)[3]
12 VDC	100Ω	1/8 Watt
20 VDC	500Ω	1/4 Watt
24 VDC	700Ω	1/2 Watt
26 VDC	800Ω	1/2 Watt
30 VDC	1.0kΩ	1/2 Watt

[2] Lower resistance is allowed, greater than 10Ω recommended.
[3] Minimum R_L wattage determined by: (0.0004 x R_L).

Typical circuit



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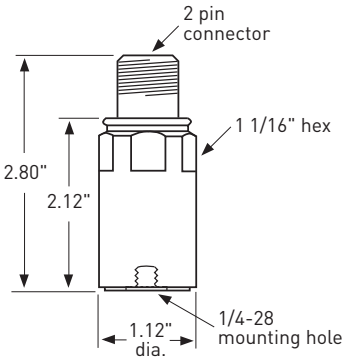
Model PC420V Series - RMS and peak Velocity loop powered sensors (LPS™)

Features
- True RMS or calculated peak output
- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection

Benefits
- Choice of output: RMS or peak, permits you to choose the sensor that best fits your industrial requirements
- Provides continuous trending of overall machine vibration
- Can help guide maintenance in prioritizing need for service
- Helps notify of impending equipment failure

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



Output, 4-20 mA

Full scale, 20 mA (±5%)	see table 1 on back
Frequency response:	
±10%	10 Hz - 1.0 kHz
±3 dB	3.5 Hz - 2.0 kHz
Repeatability	±2%
Transverse sensitivity, max.	5%

Electrical

Power requirements (two wire loop power):	
Voltage at PC420 series sensor terminals	10 VDC min, 30 VDC max
Loop resistance at 24 VDC, maximum	700Ω
Turn on time, 4-20 mA loop	30 seconds
Grounding	case isolated, internally shielded

Environmental

Operating temperature range[1]	–40 to 105°C
Vibration limit	250 g peak
Shock limit	2,500 g peak
Sealing	hermetic

Physical

Sensing element design	PZT ceramic / shear
Weight	160 grams
Case material	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	loop positive (+)
B	loop negative (–)

Notes: [1] 105°C operating temperature applies to units shipped after July 1, 2009, and with serial numbers greater than 50000.

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2)

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99009 Rev.A 6/09

Table 1: PC420Vx-yy model number selection

x (4-20 mA output type)	yy (4-20 mA full scale)
R = RMS output, velocity	05 = 0.5 ips
P = Calculated peak output, velocity	10 = 1.0 ips
	20 = 2.0 ips
	30 = 3.0 ips
	50 = 5.0 ips

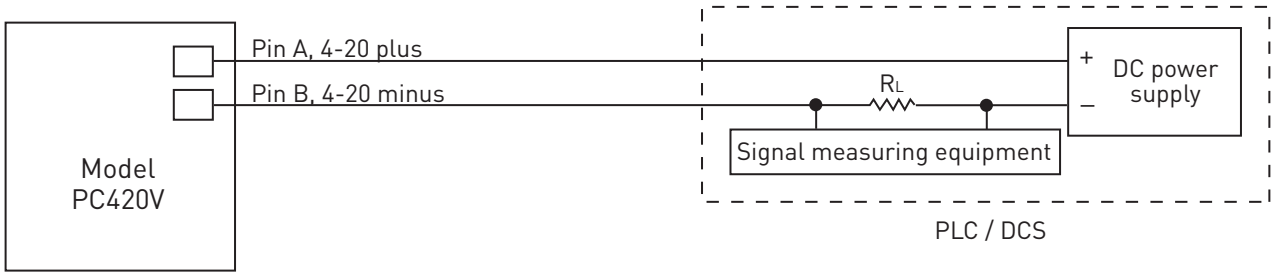
Notes: [1] Maximum loop resistance (R_L) can be calculated by:

$$R_L \text{ (max resistance)} = \frac{V_{\text{DC power}} - 10\ V}{20\ mA}$$

DC supply voltage	R_L (max resistance)[2]	R_L (minimum wattage capability)[3]
12 VDC	100Ω	1/8 Watt
20 VDC	500Ω	1/4 Watt
24 VDC	700Ω	1/2 Watt
26 VDC	800Ω	1/2 Watt
30 VDC	1.0kΩ	1/2 Watt

[2] Lower resistance is allowed, greater than 10Ω recommended.
[3] Minimum R_L wattage determined by: (0.0004 x R_L).

Typical circuit



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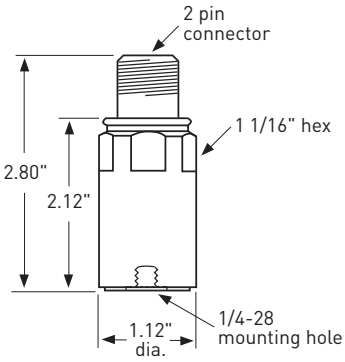
Model PC420VTP Series - true peak Velocity loop powered sensors (LPS™)

Features
- True peak output
- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection

Benefits
- Provides continuous trending of overall machine vibration
- True peak is useful for detecting high frequency impacts on reciprocating machinery
- Can help guide maintenance in prioritizing need for service
- Helps notify of changing equipment condition

The 4-20 mA output of the PC420VTP Series is proportional to the true peak velocity vibration. An output of 4 mA indicates a level of 0 ips or no vibration present. A full-scale reading of 20 mA indicates that the maximum range of vibration is present.



Output, 4-20 mA

Full scale, 20 mA (±5%)	see table 1 on back
Frequency response:	
±10%	10 Hz - 1.0 kHz
±3 dB	4 Hz - 2 kHz
Repeatability	±2%
Transverse sensitivity, max.	5%

Electrical

Power requirements (two wire loop power):	
Voltage at PC420 seriessensor terminals	10 VDC min, 30 VDC max
Loop resistance[1] at 24 VDC, maximum	700Ω
Turn on time, 4-20 mA loop	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	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	loop positive (+)
B	loop negative (–)

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2)

CE

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Table 1: PC420VTP-yy model number selection

yy (4-20 mA full scale)
05 = 0.5 ips
10 = 1.0 ips
20 = 2.0 ips
30 = 3.0 ips
50 = 5.0 ips

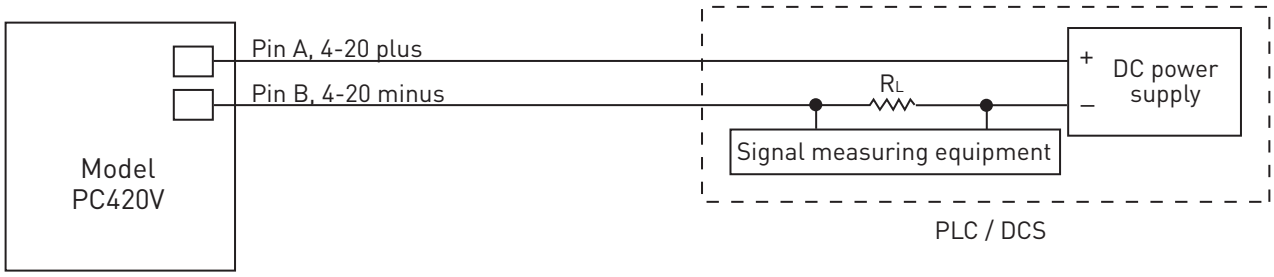
Notes: [1] Maximum loop resistance (R_L) can be calculated by:

$$R_L \text{ (max resistance)} = \frac{V_{\text{DC power}} - 10\ V}{20\ mA}$$

DC supply voltage	R_L (max resistance)[2]	R_L (minimum wattage capability)[3]
12 VDC	100Ω	1/8 Watt
20 VDC	500Ω	1/4 Watt
24 VDC	700Ω	1/2 Watt
26 VDC	800Ω	1/2 Watt
30 VDC	1.0kΩ	1/2 Watt

[2] Lower resistance is allowed, greater than 10Ω recommended.
[3] Minimum R_L wattage determined by: (0.0004 x R_L).

Typical circuit



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Model PC420DPP - 40
Seismic displacement loop powered sensor (LPS™)

Features
- Peak to peak derived from true RMS detection
- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection

Benefits
- Peak to peak output provides signal focused on machine balance
- Provides continuous trending of overall machine movement
- Useful for monitoring equipment health or controlling a process
- Minimizes influence of blade pass and gear mesh frequency.

The 4-20 mA output of the PC420DPP Series is proportional to displacement vibration. An output of 4 mA indicates no vibration present. A full-scale reading of 20 mA indicates that the maximum range of displacement is present.

Output, 4-20 mA

	English	SI
Full scale, 20 mA (±5%)	40 mils peak - peak	1.0 mm peak - peak
±10%	10 Hz - 1.0 kHz*	
±3 dB	4 Hz - 2 kHz*	
Repeatability	±2%	
Transverse sensitivity	5% max	

Electrical

Power requirements (two wire loop power):	
Voltage at PC420 series sensor terminals	10 VDC min, 30 VDC max
Loop resistance[1] at 24 VDC,	700Ω max
Turn on time, 4-20 mA loop	30 seconds
Grounding	case isolated, internally shielded

Environmental

Temperature range	–40 to 85°C
Vibration limit	500 g peak
Shock limit	2,500 g peak
Sealing	hermetic

Physical

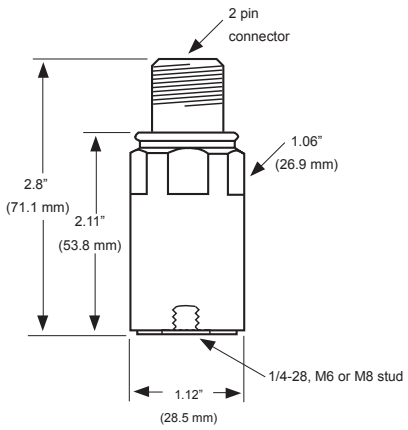
Sensing element design	PZT ceramic / shear
Weight	162 grams
Case material	316L stainless steel
Mounting	1/4 - 28 tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J9T2A

Connections

Connector pin	Function
Shell	ground
A	loop positive (+)
B	loop negative (–)

* Maximum full-scale frequency response limited to the lesser of 40 mils (1.0 mm) peak - peak or 500 g-pk

Accessories supplied: SF6 mounting stud (International customers specify M6 or M8 thread); calibration data (level 2)



See reverse

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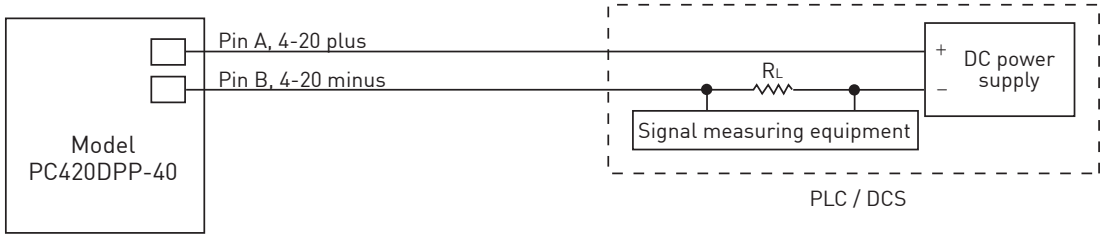
Notes: [1] Maximum loop resistance (R_L) can be calculated by:

$$R_L \text{ (max resistance)} = \frac{V_{DC\ power} - 10\ V}{20\ mA}$$

DC supply voltage	R_L (max resistance)[2]	R_L (minimum wattage capability)[3]
12 VDC	100Ω	1/8 watt
20 VDC	500Ω	1/4 watt
24 VDC	700Ω	1/2 watt
26 VDC	800Ω	1/2 watt
30 VDC	1.0kΩ	1/2 watt

[2] Lower resistance is allowed, greater than 10Ω recommended.
[3] Minimum R_L wattage determined by: (0.0004 x R_L).

Typical circuit



Interpreting the mA reading

Insert your reading in mA and the full scale value of the sensor in the following equation to find the equivalent vibration level.

$$\text{Vibration level} = \left(\frac{(\text{reading in mA} - 4)}{16\text{mA}} \right) * \text{full scale value of sensor}$$

Example: If your meter reading is 10 mA, then substituting 10 mA in the above equation yields; ((10 mA – 4)/ 16 mA) x Full scale of 40 mils (peak to peak) = 15 mils (peak to peak)

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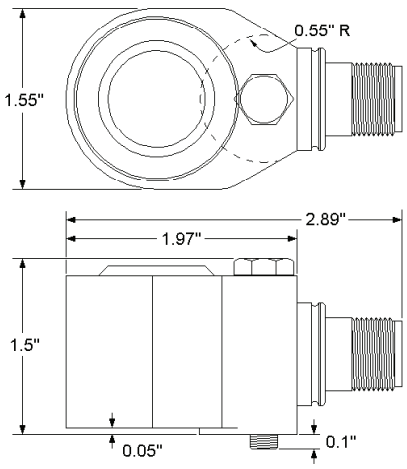
Features
- Peak equivalent, true RMS or true peak output
- Optional dynamic signal output
- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection

Benefits
- Choice of output: RMS, equivalent peak, and true peak; permits you to choose the sensor that best fits your industrial requirements
- Provides continuous trending of overall machine vibration
- Can help guide maintenance
- Dynamic signal output can allow spectral vibration measurements using the sensing element of the 4-20 mA sensor for comparisons

The 4-20 mA output of the PC421 Series is proportional to vibration. An output of 4 mA indicates a level of 0 ips or no vibration present for velocity output models and 0 g for acceleration output models. A full-scale reading of 20 mA indicates that the maximum range (RMS, Equivalent Peak or True Peak) of vibration is present.

The Dynamic signal output is an optional addition. Any of the base sensor models can also have dynamic signal output. Adding -DA to a model specifies a dynamic acceleration signal output (100 mV/g). Adding -DV to a model specifies a dynamic velocity signal output (100 mV/ips).



Model PC421 xxx-yy-Dz-series
Side exit, 4-20mA, loop-powered sensors (LPS)

Output, 4-20 mA

Full scale, 20 mA (±5%)	see Table 1 on back
Frequency response:	
±10%	10 Hz - 1.0 kHz
±3 dB	4 Hz - 2 kHz
Repeatability	±2%
Transverse sensitivity, max	5%

Output, dynamic

	PC421xxx-yy-DA	PC421xxx-yy-DV
Sensitivity (±10%)	100 mV/g	100 mV/ ips
Full scale	20g, peak	1.5 ips @ 1kHz
Frequency response:		
±3 dB	2.5 Hz - 10 kHz	2.5 Hz - 2.5 kHz
Amplitude nonlinearity, maximum	1%	
Resonant frequency, mounted, nominal	21 kHz	
Transverse sensitivity, max	5%	

Electrical

Power requirements (Two wire loop power):	
Voltage (between pins A & B)	10 VDC min, 30 VDC max
Loop resistance[1] at 24 VDC, maximum	700Ω
Turn on time, 4-20 mA loop	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	320 grams
Case material	316L stainless steel
Mounting	1/4 - 28 captive bolt
Outut connector:	
PC421xxx-yy	2 pin, MIL-C-5015 style
PC421xxx-yy-Dz	3 pin, MIL-C-5015 style
Mating connector:	
PC421xxx-yy	R6 type
PC421xxx-yy-Dz	R6G type
Recommended cabling:	
PC421xxx-yy	J9T2A
PC421xxx-yy-Dz	J9T3A

See back for notes.

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PC421xxx-yy Connector pin	PC421xxx-yy-Dz Connector pin	Function
Shell	shell	ground
A	A	loop positive (+)
B	B	loop negative (-)
N/C	C	dynamic signal

Notes: [1] maximum loop resistance (RL) can be calculated by:

$$RL\ (\text{max. resistance}) = \frac{V_{DC\ power} - 10\ V}{20\ mA}$$

DC Supply Voltage	R_L (max resistance)[2]	R_L (minimum wattage capability)[3]
12 VDC	100Ω	1/8 Watt
20 VDC	500Ω	1/4 Watt
24 VDC	700Ω	1/2 Watt
26 VDC	800Ω	1/2 Watt
30 VDC	1.0kΩ	1/2 Watt

[2] Lower resistance is allowed, greater than 10Ω recommended

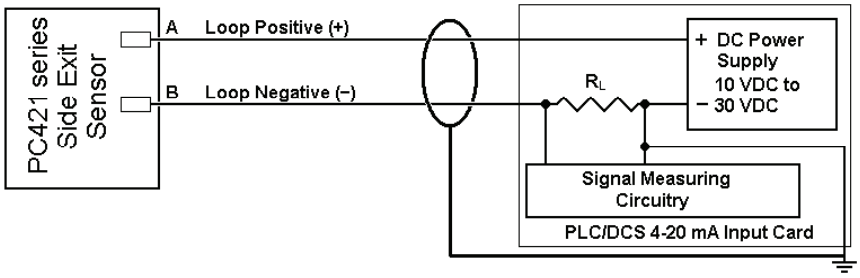
[3] Minimum R_L wattage determined by: (0.0004 x R_L)

xxx (4-20 mA output type)	-yy (full scale)	-Dz (dynamic output)[A]	
AR = acceleration, RMS	-05 = 5 g (49 m/sec2)	-DA = dynamic acceleration	100 mV/g
AP = acceleration, equivalent peak B	-10 = 10 g (98 m/sec2)		(10.2 mV/ m/sec2)
ATP = acceleration, true peak C	-20 = 20 g (196 m/sec2)	-DV = dynamic velocity	100 mV/ips
			(3.94 mV/ mm/sec)
VR = velocity, RMS	-05 = 0.5 i.p.s. (12.8 mm/sec)	-DA = dynamic acceleration	100 mV/g
VP = velocity, equivalent peak B	-10 = 1.0 i.p.s. (25.4 mm/sec)		(10.2 mV/ m/sec2)
VTP = velocity, true peak C	-20 = 2.0 i.p.s. (50.8 mm/sec)	-DV = dynamic velocity	100 mV/ips
	-30 = 3.0 i.p.s. (76.2 mm/sec)		(3.94 mV/ mm/sec)
	-50 = 5.0 i.p.s. (127 mm/sec)		

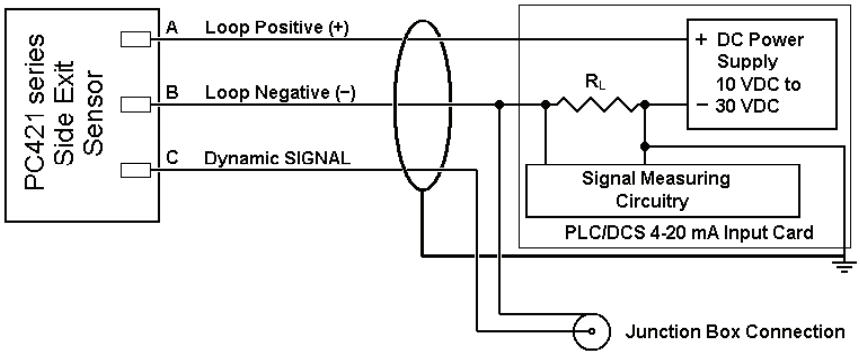
Table 1: PC421xxx-yy-Dz Model Number Selection

[A] ***Dynamic output is an option on all models.*** *If dynamic output option is not desired, do not add -DA or -DV to the model number.*
[B] ***Equivalent peak*** *output is developed based on the true RMS value of vibration. For a pure sine wave, the equivalent peak output is 1.414 times the RMS value.*
[C] ***True peak*** *output is based on the actual measured peak value using the time waveform and is not based on the RMS calculation.*

PC421xxx-yy WIRING



PC421xxx-yy-Dz WIRING



All wire and cable used for installation of the PC421-series sensor should be shielded. Generally accepted instrumentation wiring practice considers the best way to ground the shield is to connect it at the measurement end of the cable. The shield should not be wired to ground at the sensor end of the cable. Wilcoxon R6W, R6GQAI, R6GQI and R6QI type connectors all leave the shield unconnected at the sensor end of the cable.

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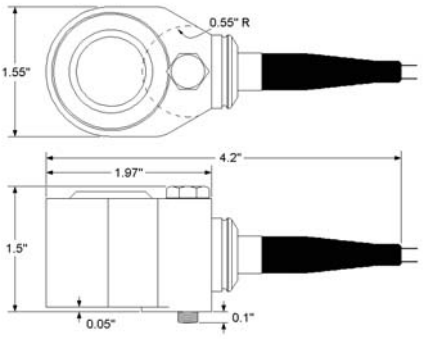
Features
- Peak equivalent, true RMS, or true peak
- Optional dynamic signal output
- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection

Benefits
- Choice of output: RMS, equivalent peak or true peak; permits you to choose the sensor that best fits your industrial requirements
- Provides continuous trending of overall machine vibration
- Can help guide maintenance

The 4-20 mA output of the PC423 Series is proportional to vibration. An output of 4 mA indicates a level of 0 ips or no vibration present for velocity output models and 0 g for acceleration output models. A full-scale reading of 20 mA indicates that the maximum range (RMS, or peak) of vibration is present.

The dynamic signal output is an optional addition. Any of the base sensor models can have dynamic signal output. Adding - DA to a model specifies a dynamic acceleration signal output (100 mV/g). Adding -DV to a model specifies a dynamic velocity signal output (100 mV/ips).



Model PC423 Series
Side exit, 4-20mA, integral cable (LPS™)

Output, 4-20 mA

Full scale, 20 mA (±5%)	see Table 1 on back
Frequency response:	
±10%	10 Hz - 1.0 kHz
±3 dB	4 Hz - 2 kHz
Repeatability	±2%
Transverse sensitivity, max	5%

Output, dynamic (optional)

	PC423xxx-yy-DA	PC423xxx-yy-DV
Sensitivity (±10%)	100 mV/g	100mV/is
Full scale	20g, peak	1.5 ips @1kHz
Frequency response:		
±3 dB	2.5 Hz - 1.8 kHz	2.5 Hz - 1.8 kHz
Amplitude nonlinearity, maximum	1%	
Resonant frequency, mounted, nominal	21 kHz	
Transverse sensitivity, ma	5%	

Electrical

Power requirements (two wire loop power):	
Voltage (between black and red wire)	10 VDC min, 30 VDC max
Loop resistance[1] at 24 VDC, maximum	700Ω
Turn on time, 4-20 mA loop	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	320 grams
Case material	316L stainless steel
Mounting	1/4 - 28 captive bolt
Cabling	J95, 16 feet, shielded, twisted pair

PC423xxx-yy	PC423xxx-yy-Dz	
Wire color	wire color	function
Shield	shield	ground
Red	red	loop positive (+)
Black	black	loop negative (-)
	white	dynamic signal (optional)
White		not used
Yellow	yellow	not used
Green	green	not used

See notes on back

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Notes: [1] maximum loop resistance (RL) can be calculated by:

$$RL\ (\text{max. resistance}) = \frac{V_{DC\ power} - 10\ V}{20\ mA}$$

DC supply voltage	RL (max resistance)[2]	RL (minimum wattage capability)[3]
12VDC	100Ω	1/8 Watt
20VDC	700Ω	1/4 Watt
24VDC	700Ω	1/2 Watt
26VDC	800Ω	1/2 Watt
30VDC	1.0Ω	1/2 Watt

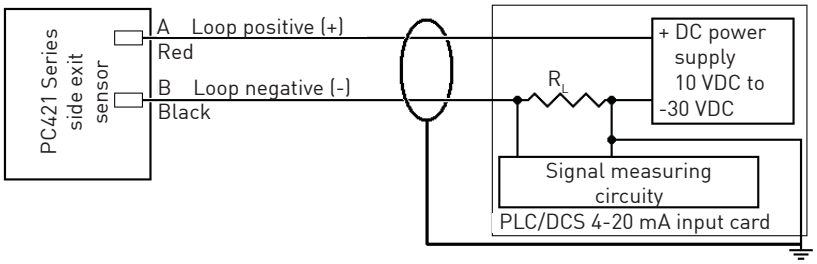
[2] Lower resistance is allowed, greater than 10Ω recommended
[3] Minimum R_L wattage determined by: (0.0004 x R_L)

xxx (4-20 mA output type)	-yy (full scale)	-Dz (dynamic output)[A]	
AR = acceleration, RMS	-05 = 5 g (49 m/sec2)	-DA = dynamic acceleration	100 mV/g
AP = acceleration, equivalent peak [B]	-10 = 10 g (98 m/sec2)		(10.2 mV/ m/sec2)
ATP = acceleration, true peak [C]	-20 = 20 g (196 m/sec2)	-DV = dynamic velocity	100 mV/ips
			(3.94 mV/ mm/sec)
VR = velocity, RMS	-05 = 0.5 i.p.s. (12.8 mm/sec)	-DA = dynamic acceleration	100 mV/g
VP = velocity, equivalent peak [B]	-10 = 1.0 i.p.s. (25.4 mm/sec)		(10.2 mV/ m/sec2)
VTP = velocity, true peak [C]	-20 = 2.0 i.p.s. (50.8 mm/sec)	-DV = dynamic velocity	100 mV/ips
	-30 = 3.0 i.p.s. (76.2 mm/sec)		(3.94 mV/ mm/sec)
	-50 = 5.0 i.p.s. (127 mm/sec)		

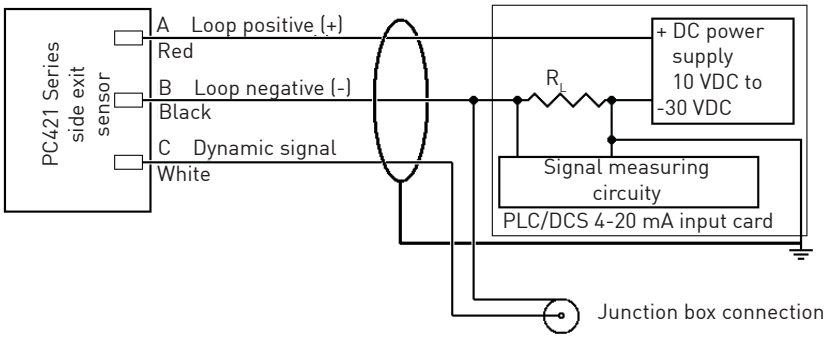
[A] ***Dynamic output is an option on all models.*** *If dynamic output option is not desired, do not add -DA or -DV to the model number.*
[B] ***Equivalent peak*** *output is developed based on the true RMS value of vibration. For a pure sine wave, the equivalent peak output is 1.414 times the RMS value.*
[C] ***True peak*** *output is based on the actual measured peak value using the time waveform and is not based on the RMS calculation.*

Table 1: PC423xxx-yy-Dz Model number selection

PC423xxx-yy wiring



PC423xxx-yy-Dz wiring



All wire and cable used for installation of the PC423 Series sensor should be shielded. Generally accepted instrumentation wiring practice considers the best way to ground the shield is to connect it at only one end of the cable. The shield should not be wired to ground at both ends of the cable. The Wilcoxon PC423 Series sensor has the shield connected to the case at the sensor end of the cable.

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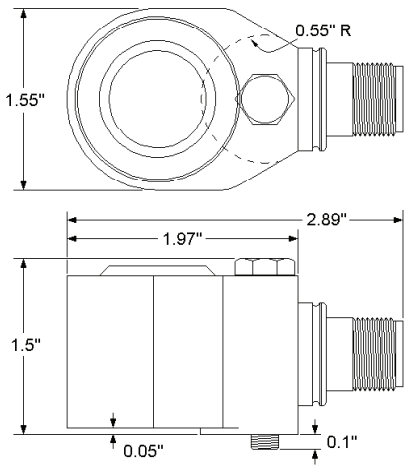
Features
- Peak equivalent, true RMS or true peak output
- Temperature signal output
- Optional dynamic signal output
- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection

Benefits
- Choice of output: RMS, equivalent peak, and true peak; permits you to choose the sensor that best fits your industrial requirements
- Provides continuous trending of overall machine vibration
- Can help guide maintenance

The 4-20 mA output of the PC425 Series is proportional to vibration. An output of 4 mA indicates a level of 0 ips or no vibration present for velocity output models and 0 g for acceleration output models. A full-scale reading of 20 mA indicates that the maximum range (RMS, Equivalent Peak or True Peak) of vibration is present.

The Dynamic signal output is an optional addition. Any of the base sensor models can also have dynamic signal output. Adding -DA to a model specifies a dynamic acceleration signal output (100 mV/g). Adding -DV to a model specifies a dynamic velocity signal output (100 mV/ips).

The temperature output of the PC425 Series is in terms of degrees Kelvin (°K), where zero °K = -273°C. The voltage output at 0°C = 2.73 Volts (273°K). The voltage output at 80°C = 3.53 Volts(353°K).



Model PC425 Series
4-20mA vibration and temperature voltage (LPS™)

Output, 4-20 mA

Full scale, 20 mA (±5%)	see Table 1 on back
Frequency response:	
±10%	10 Hz - 1.0 kHz
±3 dB	4 Hz - 2 kHz
Repeatability	5%
Transverse sensitivity, max	see Table 1 on back

Output, temperature

Temperature output sensitivity, ±5°K	10 mV/°K
Temperature measurement range	223 to 388°K (-50 to 85°C)

Output, dynamic (optional)

	PC425xxx-yy-DA	PC425xxx-yy-DV
Sensitivity (±10%)	100 mV/g	100 mV/ ips
Full scale	20g, peak	1.5 ips @ 1kHz
Frequency response:		
±3 dB	2.5 Hz - 10 kHz	2.5 Hz - 2.5 kHz
Amplitude nonlinearity, maximum	1%	
Resonant frequency, mounted, nominal	21 kHz	
Transverse sensitivity, max	5%	

Electrical

Power requirements (Two wire loop power):	
Voltage (between pins A & B)	10 VDC min, 30 VDC max
Loop resistance[1] at 24 VDC, maximum	700Ω
Turn on time, 4-20 mA loop	30 seconds
Grounding	case isolated, internally shielded
Power requirements (temperature sensor):[4]	
Current	0.4 to 5 mA

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	320 grams
Case material	316L stainless steel
Mounting	1/4 - 28 captive bolt
Output connector	MIL-5015 style, 6-pin
Mating connector	R19SLI style
Recommended cabling	J9T4 / J9T4A

See back for notes.

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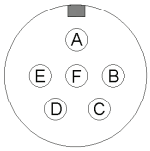
Connector pin	Function
Shell	ground
A	loop positive (+)
B	loop negative (-)
C	dynamic signal (optional)
D	temperature signal
E	temperature common
F	not used



6-pin

Notes: [1] maximum loop resistance (RL) can be calculated by:

$$RL\ (\text{max. resistance}) = \frac{V_{DC\ power} - 10\ V}{20\ mA}$$

DC Supply Voltage	R_L (max resistance)[2]	R_L (minimum wattage capability)[3]
12 VDC	100Ω	1/8 Watt
20 VDC	500Ω	1/4 Watt
24 VDC	700Ω	1/2 Watt
26 VDC	800Ω	1/2 Watt
30 VDC	1.0kΩ	1/2 Watt

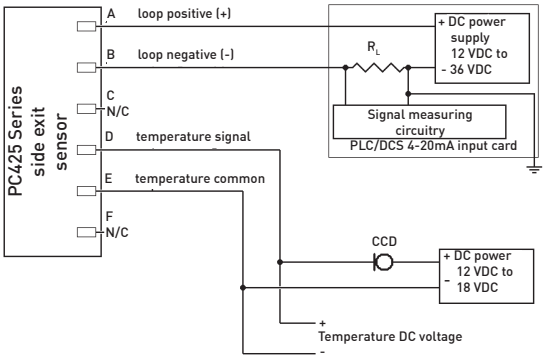
[2] Lower resistance is allowed, greater than 10Ω recommended
[3] Minimum R_L wattage determined by: (0.0004 x R_L)
[4] The temperature sensor must have a current flow to operate. This current can be provided through constant-current diodes (i.e. Vishay J508, etc.)

xxx (4-20 mA output type)	-yy (full scale)	-Dz (dynamic output)[A]	
AR = acceleration, RMS	-05 = 5 g (49 m/sec2)	-DA = dynamic acceleration	100 mV/g
AP = acceleration, equivalent peak B	-10 = 10 g (98 m/sec2)		(10.2 mV/ m/sec2)
ATP = acceleration, true peak C	-20 = 20 g (196 m/sec2)	-DV = dynamic velocity	100 mV/ips
			(3.94 mV/ mm/sec)
VR = velocity, RMS	-05 = 0.5 i.p.s. (12.8 mm/sec)	-DA = dynamic acceleration	100 mV/g
VP = velocity, equivalent peak B	-10 = 1.0 i.p.s. (25.4 mm/sec)		(10.2 mV/ m/sec2)
VTP = velocity, true peak C	-20 = 2.0 i.p.s. (50.8 mm/sec)	-DV = dynamic velocity	100 mV/ips
	-30 = 3.0 i.p.s. (76.2 mm/sec)		(3.94 mV/ mm/sec)
	-50 = 5.0 i.p.s. (127 mm/sec)		

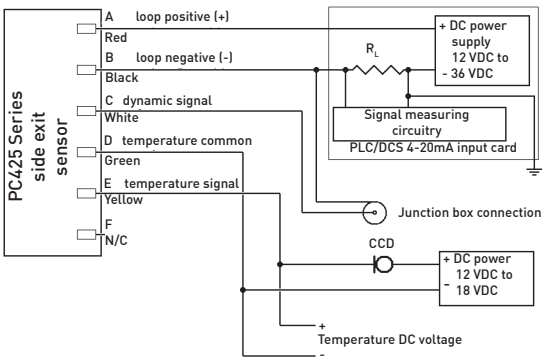
Table 1: PC425xxx-yy-Dz Model Number Selection

[A] ***Dynamic output is an option on all models.*** *If dynamic output option is not desired, do not add -DA or -DV to the model number.*
[B] ***Equivalent peak*** *output is developed based on the true RMS value of vibration. For a pure sine wave, the equivalent peak output is 1.414 times the RMS value.*
[C] ***True peak*** *output is based on the actual measured peak value using the time waveform and is not based on the RMS calculation.*

PC425xxx-yy wiring



PC425xxx-yy-Dz wiring



All wire and cable used for installation of the PC425 Series sensor should be shielded. Generally accepted instrumentation wiring practice considers the best way to ground the shield is to connect it at the measurement end of the cable. The shield should not be wired to ground at the sensor end of the cable. The Wilcoxon R19SLI type connector leaves the shield unconnected at the sensor end of the cable.

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Model PC427 Series
Side exit, 4-20mA, integral cable
Vibration and temperature voltage (LPS™)

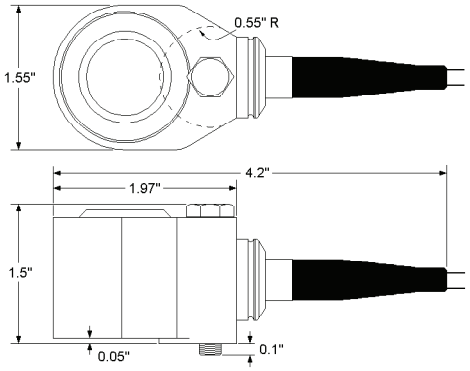
Features
- Peak equivalent, true RMS or true peak output
- Temperature signal output
- Optional dynamic signal output
- Corrosion resistant
- Hermetic seal
- ESD protection
- Overload protection
- Reverse wiring protection

Benefits
- Choice of output: RMS, equivalent peak, and true peak; permits you to choose the sensor that best fits your industrial requirements
- Provides continuous trending of overall machine vibration
- Can help guide maintenance

The 4-20 mA output of the PC427 Series is proportional to vibration. An output of 4 mA indicates a level of 0 ips or no vibration present for velocity output models and 0 g for acceleration output models. A full-scale reading of 20 mA indicates that the maximum range (RMS, equivalent peak or true peak) of vibration is present.

The dynamic signal output is an optional addition. Any of the base sensor models can also have dynamic signal output. Adding -DA to a model specifies a dynamic acceleration signal output (100 mV/g). Adding -DV to a model specifies a dynamic velocity signal output (100 mV/ips).

The temperature output of the PC427 Series is in terms of degrees kelvin (°K), where zero °K = -273°C. The voltage output at 0°C = 2.73 volts (273°K). The voltage output at 80°C = 3.53 volts (353°K).



Output, 4-20 mA

Full scale, 20 mA (±5%	see table 1 on back
Frequency response:	
±10%	10 Hz - 1.0 kHz
±3 dB	4 Hz - 2 kHz
Repeatability	±2%
Transverse sensitivity, max	5%

Output temperature

Temperature output sensitivity, ±5°K	10 mV/°K
Temperature measurement range	223 to 358°K (–50 to 85°C)

Output, dynamic (optional)

	PC427xxx-yy-DA	PC427xxx-yy-DV
Sensitivity (±10%	100 mV/g	100 mV/ ips
Full scale	20g, peak	1.5 ips @ 1kHz
Frequency response:		
±3 dB	2.5 Hz - 10 kHz	2.5 Hz - 2.5 kHz
Amplitude nonlinearity, maximum	1%	
Resonant frequency, mounted, nominal	21 kHz	
Transverse sensitivity, max	5%	

Electrical

Power requirements (two wire loop power):	
Voltage (between black and red wire)	10 VDC min, 30 VDC max
Loop resistance[1] at 24 VDC, maximum	700Ω
Turn on time, 4-20 mA loop	30 seconds
Grounding	case isolated, internally shielded
Power requirements (two wire loop power):	
Current	0.4 to 5 mA

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	320 grams
Case material	316L stainless steel
Mounting	1/4 - 28 captive bolt
Cabling	J95

Cable wire	Function
Shield	ground
Red	loop positive (+)
Black	loop negative (-)
White	dynamic signal (optional)
Yellow	temperature signal
Green	temperature common

See back for notes.

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Notes: [1] maximum loop resistance (RL) can be calculated by:

$$RL\ (\text{max. resistance}) = \frac{V_{DC\ power} - 10\ V}{20\ mA}$$

DC Supply Voltage	R_L (max resistance)[2]	R_L (minimum wattage capability)[3]
12 VDC	100Ω	1/8 Watt
20 VDC	500Ω	1/4 Watt
24 VDC	700Ω	1/2 Watt
26 VDC	800Ω	1/2 Watt
30 VDC	1.0kΩ	1/2 Watt

[2] Lower resistance is allowed, greater than 10Ω recommended
[3] Minimum R_L wattage determined by: (0.0004 x R_L)
[4] The temperature sensor must have a current flow to operate. This current can be provided through constant-current diodes (i.e. Vishay J508, etc.)

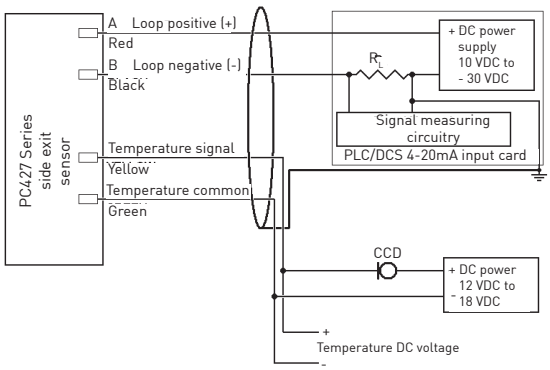
Table 1: PC427xxx-yy-Dz Model number selection

xxx (4-20 mA output type)	-yy (full scale)	-Dz (dynamic output)[A]	
AR = acceleration, RMS AP = acceleration, equivalent peak [B] ATP = acceleration, true peak [C]	-05 = 5 g (49 m/sec2) -10 = 10 g (98 m/sec2) -20 = 20 g (196 m/sec2)	-DA = dynamic acceleration -DV = dynamic velocity	100 mV/g (10.2 mV/ m/sec2) 100 mV/ips (3.94 mV/ mm/sec)
VR = velocity, RMS VP = velocity, equivalent peak [B] VTP = velocity, true peak [C]	-05 = 0.5 i.p.s. (12.8 mm/sec) -10 = 1.0 i.p.s. (25.4 mm/sec) -20 = 2.0 i.p.s. (50.8 mm/sec) -30 = 3.0 i.p.s. (76.2 mm/sec) -50 = 5.0 i.p.s. (127 mm/sec)	-DA = dynamic acceleration -DV = dynamic velocity	100 mV/g (10.2 mV/ m/sec2) 100 mV/ips (3.94 mV/ mm/sec)

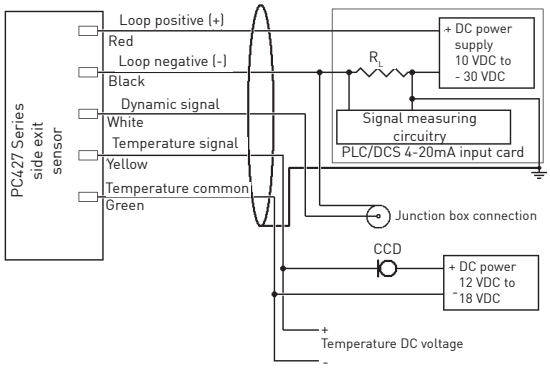
Table 1: PC427xxx-yy-Dz Model number selection

*[A] **Dynamic output is an option on all models.** If dynamic output option is not desired, do not add -DA or -DV to the model number.*
*[B] **Equivalent peak** output is developed based on the true RMS value of vibration. For a pure sine wave, the equivalent peak output is 1.414 times the RMS value.*
*[C] **True peak** output is based on the actual measured peak value using the time waveform and is not based on the RMS calculation.*

PC427xxx-yy wiring



PC427xxx-yy-Dz wiring



All wire and cable used for installation of the PC425 Series sensor should be shielded. Generally accepted instrumentation wiring practice considers the best way to ground the shield is to connect it at only one end of the cable. The shield should not be wired to ground at both ends of the cable. The Wilcoxon PC427 Series sensor has the shield connected to the case at the sensor end of the cable.

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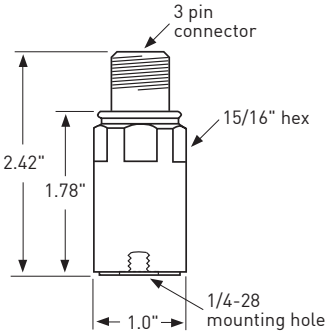
Wilcoxon Research

Model 793T-3
General purpose accelerometer with internal temperature sensor

Features
- Senses both acceleration and temperature
- Rugged design
- Hermetic seal
- Ground isolated
- ESD protection
- Reverse wiring



Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response:	
±5%	1.5 - 5,000 Hz
±10%	1.0 - 7,000 Hz
±3 dB	0.5- 15,000 Hz
Resonance frequency	24 kHz
Transverse sensitivity, max.	5% of axial
Temperature response:	
–50°C	–10%
+120°C	+5%
Temperature output sensitivity, ±5%	10 mV/°K
Temperature measurement range	223 to 390°K (–50 to 120°C)

Electrical

Temperature sensor		
Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 4 mA
Grounding		case isolated, internally shielded
Accelerometer		
Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	600 µg
Spectral	10 Hz	8 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g.	10 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.0005 g/µstrain

Physical

Sensing element design	PZT ceramic / compression
Weight	115 grams
Case material	316L stainless steel
Mounting	1/4-28 tapped hole
Output connector	3 pin, MIL-C-5015 style
Mating Connector	R6G type
Recommended cabling	J9T3A

Connector pin	Function
Shell	ground
A	accelerometer– power & signal
B	accelerometer– temperature / sensor common
C	temperature sensor– power & signal

Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 3)

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Model 797T-1
General purpose accelerometer with internal temperature sensor

Dynamic

Sensitivity, ±5%, 25°C		100 mV/g
Acceleration range		80 g peak
Amplitude nonlinearity		1%
Frequency response:		
±5%		3 - 5,000 Hz
±10%		2 - 7,000 Hz
±3 dB		1 - 12,000 Hz
Resonance frequency		26 kHz
Transverse sensitivity, max		5 % of axial
Temperature response		
–50°C		–5%
+120°C		+5%
Temperature output sensitivity, ±5%		10 mV/°K
Temperature measurement range		223 to 390°K (–50 to 120°C)

Electrical

Temperature sensor		
Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 4 mA
Grounding		case isolated, internally shielded
Accelerometer		
Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	600 µg
Spectral	10 Hz	8 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g	30 µg/gauss
Seal	hermetic
Base strain sensitivity	0.002 g/µstrain

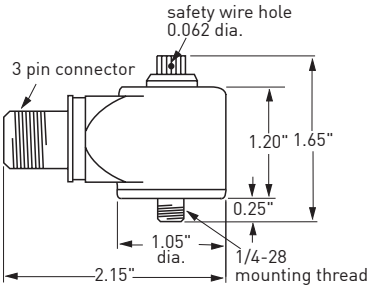
Physical

Sensing element design	PZT ceramic / shear
Weight	135 grams
Case material	316L stainless steel
Mounting	1/4-28 captive socket head screw
Output connector	3 pin, MIL-C-5015 style
Mating connector	R6G type
Recommended cabling	J9T3A

Accessories supplied: #12105-01 captive screw (International customers specify mounting requirements); calibration data (level 3)

Features

- Senses both acceleration and temperature
- Rugged design
- Hermetic seal
- Ground isolated
- ESD protection
- Reverse wiring protection
- Mounts in any orientation



Connections

Connector pin	Function
Shell	ground
A	accelerometer, power / signal
B	accelerometer / temperature common
C	temperature sensor, power / signal

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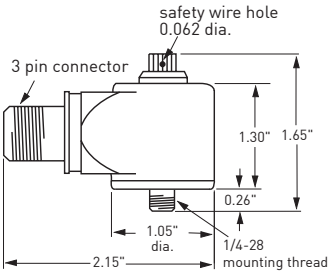
Wilcoxon Research

Model 797LT
Low frequency accelerometer with temperature sensor

Features
- Senses both acceleration and temperature
- Corrosion resistant
- Hermetic seal
- Ground isolated
- ESD protection
- Reverse wiring protection



Dynamic

Sensitivity, ±5%, 25°C		500 mV/g
Acceleration range		10 g peak
Amplitude nonlinearity		1%
Frequency response:		
±5%		0.6 - 850 Hz
±10%		0.4 - 1,500 Hz
±3 dB		0.2 - 3,700 Hz
Resonance frequency		18 kHz
Transverse sensitivity, max		7% of axial
Temperature response:		
–50°C		–5%
+120°C		+5%
Temperature output sensitivity, ±5%		10 mV/°K
Temperature measurement range		223 to 390°K (–50 to 120°C)

Electrical

Temperature sensor		
Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 4 mA
Grounding		case isolated, internally shielded
Accelerometer		
Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	12 µg
Spectral	2 Hz	2 µg/√Hz
	10 Hz	0.6 µg/√Hz
	100 Hz	0.2 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		10 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	250 g peak
Shock limit	2,500 g peak
Electromagnetic sensitivity, equiv. g	5 µg/gauss
Base strain sensitivity	0.001 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	160 grams
Case material	316L stainless steel
Mounting	1/4-28 captive socket head screw
Output connector	3 pin, MIL-C-5015 style
Mating connector	R6G type

Connector pin	Function
Shell	ground
A	accelerometer, power / signal
B	accelerometer / temperature common
C	temperature sensor, power / signal

Accessories supplied: #12105-01 captive screw (International customers specify mounting requirements); calibration data (level 3).

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Wilcoxon Research

Model 786T
General purpose accelerometer with internal temperature sensor

Features
- Measures both acceleration and temperature
- Rugged design
- Corrosion resistant
- Hermetic seal
- Case isolated
- ESD protection
- Reverse wiring protection

Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range	60 g peak
Amplitude nonlinearity	1%
Frequency response:	
± 5%	3 - 5,000 Hz
±10%	1 - 7,000 Hz
± 3 dB	0.5 - 12,000 Hz
Resonance frequency	30 kHz
Transverse sensitivity, max	5% of axial
Temperature response:	
–50°C	–10%
+120°C	+6%
Temperature output sensitivity, ± 1.5°C	10 mV/°C
Temperature measurement range	+2°C to +120°C

Electrical

Power requirement: voltage source	18 - 30 VDC
current regulating diode	2 - 10 mA
Electrical noise, equiv. g:	
Broadband 2.5 Hz to 25 kHz	700 µg
Spectral 10 Hz	10 µg/√Hz
100 Hz	5 µg/√Hz
1000 Hz	5 µg/√Hz
Output impedance, max.	100 Ω
Bias output voltage, nominal.	10 VDC
Grounding	case isolated, internally shielded

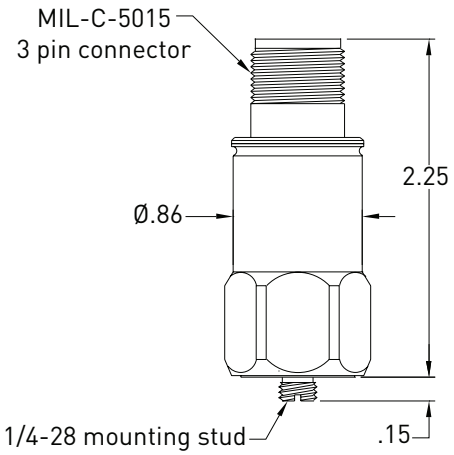
Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g, max .	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max.	0.0002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	90 grams
Case material	316L stainless steel
Mounting	1/4 - 28 UNF tapped hole
Output connector	3 pin, MIL-C-5015 style
Mating connector	R6G
Recommended cabling	J9T3A

Connector pin	Function
Shell	ground
A	accelerometer power/ signal
B	accelerometer common
C	temperature sensor signal



Accessories supplied: SF6 mounting stud (International customers specify mounting requirements); calibration data (level 2)

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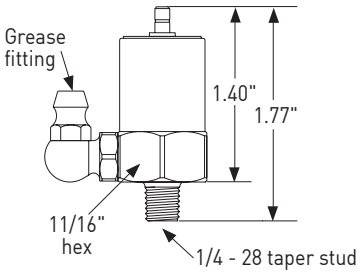
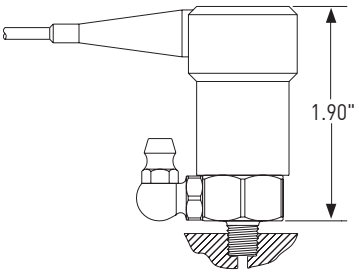
98733 Rev.A.3 12/07

Zerkometer™ model 221A
Accelerometer with fitting mounting

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- ESD protection
- Reverse wiring protection
- Grease channel through sensor body



Model 221A



Model 221A with
mating connector and cable

Dynamic

Sensitivity, ±20%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response, nominal[1] :	
± 3 dB	0.5 - 7,000 Hz
Resonance frequency, nominal	13 kHz
Transverse sensitivity, max	5% of axial
Temperature response	
–50°C	–7%
+80°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated

Environmental

Temperature range	–50 to 80°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Sealing	hermetic
Base strain sensitivity, max	0.00002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	53 grams
Case material	316L stainless steel
Mounting	1/4 - 28 taper stud
Zerk grease fitting	Steel, 90° angle 1/4-28 taper
Mating connector	R35
Recommended cabling	J96

Connector pin	Function	Cable conductor
Shell	common	shield
Pin	power/ signal	center
Housing	isolated	N/C

Notes: [1] Mounted with 50 lbs inch torque
Accessories supplied: Model GF90: 90° steel 1/4-28 Zerk grease fitting; calibration data (level 2)
Available accessories: GFA18 – Grease fitting adapter, 1/4-28 taper - 1/8 female; Hex thread mounting adapters; (call factory customer service)

CE

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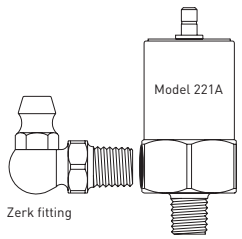
Installation

Prior to installation, thoroughly clean the area on the machine around the existing Zerk fitting without removing it. All dirt, grease, loose paint, and foreign material must be removed before attempting to install the Zerkometer.

Remove the existing Zerk fitting from the machine using the appropriate wrench.

Hand thread new 90° Zerk fitting into the body of the Zerkometer. Using the appropriate wrench, tighten the new Zerk fitting into position using 25/50 inch-pounds torque. Inject grease through the Zerk fitting until grease exits the center bored channel in the base of the mounting thread. Allow some additional grease to flow through the Zerkometer body and examine the grease to ensure that no foreign particles are present in the grease. This will ensure that the Zerkometer body has no foreign contamination that will enter the bearing after installation.

If it is necessary to remove the 90° Zerk fitting in order to install the Zerkometer body, use an appropriate sized wrench to remove the 90° Zerk fitting now.



Hand thread the Zerkometer into the machine housing, being careful not to cross-thread the Zerkometer. Using an 11/16" wrench, tighten the Zerk base into position using no more than 50 inch-pounds torque.

If the 90° Zerk fitting was removed for installation of the Zerkometer body, hand thread the Zerk fitting into the body of the Zerkometer. Using the appropriate wrench, torque the new Zerk fitting into position using 25/50 inch-pounds torque.

Additional grease may be applied to the fitting at this time, if desired.

Grease tube adapter

A 1/4- 28 UNS external thread to 1/8 – 27 NPT internal thread adapter is available for locations requiring remote greasing. (GFA 18)

Greasing

Grease is applied to the bearing through the Zerkometer in the same manner that grease would be applied using any other bearing grease. The grease for the bearing is applied through the extended grease channel that passes through the base of the Zerkometer mounting.

Changing Zerk fittings

The side of the Zerkometer is tapped for a 1/4-28 Tapered Zerk fitting. The standard Zerkometer is supplied with a steel 1/4-28 Tapered 90° Zerk fitting. Any stainless steel or steel 1/4-28 Tapered Zerk fitting may be installed.

WARNING – Use only steel fittings. The body of the Zerkometer is manufactured from stainless steel. DO NOT USE BRASS fittings. Only steel or stainless steel fittings should be used. Brass is not compatible with stainless steel. Using brass will result in galvanic corrosion of the accelerometer body.

NOTE: it may be easier to replace Zerk fittings on the Zerkometer when it is not installed in-place on a machine.

If the Zerkometer is installed on a machine thoroughly clean the area on the machine around the Zerkometer. All dirt, grease, loose paint, and foreign material must be removed.

Using the appropriate wrench, loosen the Zerkometer and unscrew it from the machinery.

Using the appropriate wrench, remove the Zerk fitting installed in the Zerkometer.

Hand thread the new Zerk fitting into the body of the Zerk Base. Using the appropriate wrench, tighten the new Zerk fitting into position using 25/50 inch-pounds torque.

Inject grease through the Zerkometer's Zerk fitting until grease exits the center bored channel in the base of the mounting thread. Allow some additional grease to flow through the Zerkometer body and examine the grease to insure that no foreign particles are present in the grease. This will help to assure that the Zerkometer body has no foreign contamination that will enter the bearing after installation.

Hand thread the Zerkometer into the machine housing, being careful not to cross-thread the Zerkometer. Using an 11/16" wrench, tighten the Zerk base into position using no more than 50 inch-pounds torque.

Additional grease may be applied to the fitting at this time, if desired.

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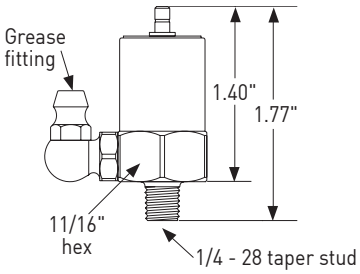
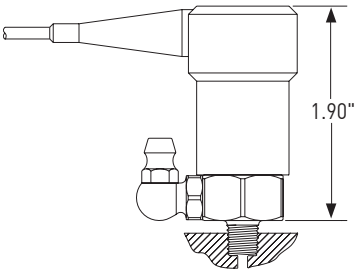
MEGGiTT
smart engineering for extreme environments

Zerkometer™ model 221B
Accelerometer with fitting mounting

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- ESD protection
- Reverse wiring protection
- Grease channel through sensor body



Model 221B



Model 221B with
mating connector and cable

Dynamic

Sensitivity, ±20%, 25°C		100 mV/g
Acceleration range		80 g peak
Amplitude nonlinearity		1%
Frequency response, nominal[1] :		
± 3 dB		0.5 - 10,000 Hz
Resonance frequency, nominal		18 kHz
Transverse sensitivity, max		5% of axial
Temperature response		–50°C –7%
		+80°C +5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated

Environmental

Temperature range	–50 to 80°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Sealing	hermetic
Base strain sensitivity, max.	0.00002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	57 grams
Case material	316L stainless steel
Mounting	1/8 - 27 NPT stud
Zerk grease fitting	steel, 90° angle 1/4-28 taper
Mating connector	R35
Recommended cabling	J96

Connector pin	Function	Cable conductor
Shell	common	shield
Pin	power/ signal	center
Housing	isolated	N/C

Notes:[1] At 200 inch lbs. torque and 0.225 inch thread engagement
Accessories supplied: Model GF90: 90° steel 1/4-28 Zerk grease fitting; calibration data (level 2)
Available accessories: GFA18 – Grease fitting adapter, 1/4-28 taper - 1/8 female;
Hex thread mounting adapters; (call factory customer service)

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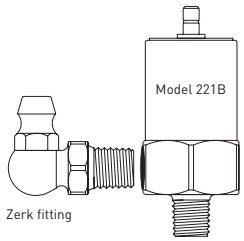
98773 Rev.A.2 12/07

Installation

Prior to installation, thoroughly clean the area on the machine around the existing Zerk fitting without removing it. All dirt, grease, loose paint, and foreign material must be removed before attempting to install the Zerkometer.

Remove the existing Zerk fitting from the machine using the appropriate wrench.

Hand thread new 90° Zerk fitting into the body of the Zerkometer. Using the appropriate wrench, tighten the new Zerk fitting into position using at least 25, but no more than 50 inch-pounds torque. Inject grease through the Zerk fitting until grease exits the center bored channel in the base of the mounting thread. Allow some additional grease to flow through the Zerkometer body and examine the grease to ensure that no foreign particles are present in the grease. This will ensure that the Zerkometer body has no foreign contamination that will enter the bearing after installation.



If it is necessary to remove the 90° Zerk fitting in order to install the Zerkometer body, use an appropriate sized wrench to remove the 90° Zerk fitting now.

Hand thread the Zerkometer into the machine housing, being careful not to cross-thread the Zerkometer. Using an 11/16" wrench, tighten the Zerk base into position using no more than 200 inch-pounds torque.

If the 90° Zerk fitting was removed for installation of the Zerkometer body, hand thread the Zerk fitting into the body of the Zerkometer. Using the appropriate wrench, torque the new Zerk fitting into position using at least 25, but no more than 50 inch-pounds.

Additional grease may be applied to the fitting at this time, if desired.

Grease tube adapter

A 1/4- 28 UNS external thread to 1/8 – 27 NPT internal thread adapter is available for locations requiring remotw greasing. (GFA 18)

Greasing

Grease is applied to the bearing through the Zerkometer in the same manner that grease would be applied using any other bearing grease. The grease for the bearing is applied through the extended grease channel that passes through the base of the Zerkometer mounting.

Changing zerk fittings

The side of the Zerkometer is tapped for a 1/4-28 Tapered Zerk fitting. The standard Zerkometer is supplied with a steel 1/4-28 Tapered 90° Zerk fitting.

WARNING – Use only steel fittings. The body of the Zerkometer is manufactured from stainless steel. DO NOT USE BRASS fittings. Only steel or stainless steel fittings should be used. Brass is not compatible with stainless steel. Using brass will result in galvanic corrosion of the accelerometer body.

Any stainless steel or steel 1/4-28 Tapered Zerk fitting may be installed.

NOTE: it may be easier to replace Zerk fittings on the Zerkometer when it is not installed in-place on a machine.

If the Zerkometer is installed on a machine thoroughly clean the area on the machine around the Zerkometer. All dirt, grease, loose paint, and foreign material must be removed.

Using the appropriate wrench, loosen the Zerkometer and unscrew it from the machinery.

Using the appropriate wrench, remove the Zerk fitting installed in the Zerkometer.

Hand thread the new Zerk fitting into the body of the Zerk Base. Using the appropriate wrench, tighten the new Zerk fitting into position using at least 25, but no more than 50 inch-pounds.

Inject grease through the Zerkometer's Zerk fitting until grease exits the center bored channel in the base of the mounting thread. Allow some additional grease to flow through the Zerkometer body and examine the grease to insure that no foreign particles are present in the grease. This will help to assure that the Zerkometer body has no foreign contamination that will enter the bearing after installation.

Hand thread the Zerkometer into the machine housing, being careful not to cross-thread the Zerkometer. Using an 11/16" wrench, tighten the Zerk base into position using no more than 200 inch-pounds torque.

Additional grease may be applied to the fitting at this time, if desired.

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Zerkometer™ model 222A
Accelerometer with fitting mounting

Features
- Rugged design
- Corrosion resistant
- Hermetic seal
- Case isolated
- ESD protection
- Reverse wiring protection
- Grease channel through sensor body

Dynamic

Sensitivity, ±10%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response[1], nominal:	
± 5%	3 - 5,000 Hz
±10%	1 - 6,000 Hz
± 3 dB	0.5 - 8,500 Hz
Resonance frequency	23 kHz
Transverse sensitivity, max	5% of axial
Temperature response	–50°C –5% +120°C +5%

Electrical

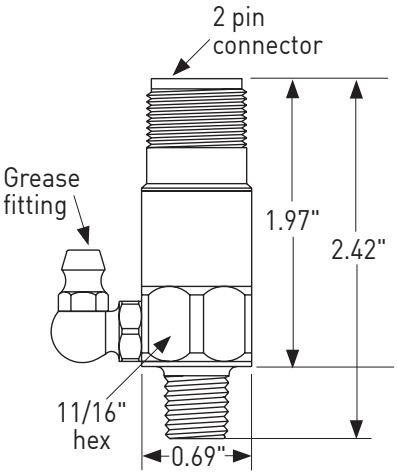
Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	700 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	5 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity, equiv. g, max .	70 µg/gauss
Sealing	hermetic
Base strain sensitivity, max.	0.00002 g/µstrain

Physical

Sensing element design	PZT ceramic / shear
Weight	76 grams
Case material	316L stainless steel
Mounting	1/8 - 27 NPT stud
Zerk grease fitting	steel, 90° angle 1/4-28 taper
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J10 / J9T2A



Connector pin	Function
Shell	ground
A	power/ signal
B	common

Notes: [1] At 200 inch/ lb. torque and 0.225 inch thread engagement

Accessories supplied: Model GF90: 90° steel 1/4-28 Zerk grease fitting; Calibration data (level 2)
Available accessories: GFA18 – Grease fitting adapter, 1/4-28 taper - 1/8 female; Hex thread mounting adapters;(call factory customer service)

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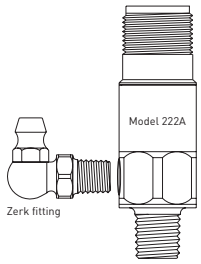
98715 Rev.A.4 12/07

Installation

Prior to installation, thoroughly clean the area on the machine around the existing Zerk fitting without removing it. All dirt, grease, loose paint, and foreign material must be removed before attempting to install the Zerkometer.

Remove the existing Zerk fitting from the machine using the appropriate wrench.

Hand thread new 90° Zerk fitting into the body of the Zerkometer. Using the appropriate wrench, tighten the new Zerk fitting into position using at least 25, but no more than 50 inch-pounds. Inject grease through the Zerk fitting until grease exits the center bored channel in the base of the mounting thread. Allow some additional grease to flow through the Zerkometer body and examine the grease to ensure that no foreign particles are present in the grease. This will ensure that the Zerkometer body has no foreign contamination that will enter the bearing after installation.



If it is necessary to remove the 90° Zerk fitting in order to install the Zerkometer body, use an appropriate sized wrench to remove the 90° Zerk fitting now.

Hand thread the Zerkometer into the machine housing, being careful not to cross-thread the Zerkometer. Using an 11/16" wrench, tighten the Zerkometer into position using no more than 200 inch-pounds torque.

If the 90° Zerk fitting was removed for installation of the Zerkometer body, hand thread the Zerk fitting into the body of the Zerkometer.

Using the appropriate wrench, torque the new Zerk fitting into position using at least 25, but no more than 50 inch-pounds.

Additional grease may be applied to the fitting at this time, if desired.

Grease tubing adapter

A 1/4- 28 UNS external thread to 1/8 – 27 NPT internal thread adapter is available for locations requiring remote greasing. (GFA18)

Greasing

Grease is applied to the bearing through the Zerkometer in the same manner that grease would be applied using any other bearing grease. The grease for the bearing is applied through the extended grease channel that passes through the base of the Zerkometer mounting.

Changing zerk fittings

The side of the Zerkerkometer is tapped for a 1/4-28 Tapered Zerk fitting. The standard Zerkometer is supplied with a steel 1/4-28 Tapered 90° Zerk fitting.

WARNING – Use only steel fittings. The body of the Zerkometer is manufactured from stainless steel. DO NOT USE BRASS fittings. Only steel or stainless steel fittings should be used. Brass is not compatible with stainless steel. Using brass will result in galvanic corrosion of the accelerometer body.

Any stainless steel or steel 1/4-28 Tapered Zerk fitting may be installed.

NOTE: it may be easier to replace Zerk fittings on the Zerkometer base when it is not installed in-place on a machine.

If the Zerkometer is installed on a machine thoroughly clean the area on the machine around the Zerkometer. All dirt, grease, loose paint, and foreign material must be removed.

Using the appropriate wrench, loosen the Zerkometer and unscrew it from the machinery.

Using the appropriate wrench, remove the Zerk fitting installed in the Zerkometer.

Hand thread the new Zerk fitting into the body of the Zerkometer. Using the appropriate wrench, tighten the new Zerk fitting into position using at least 25, but no more than 50 inch-pounds.

Inject grease through the Zerkometer's Zerk fitting until grease exits the center bored channel in the base of the mounting thread. Allow some additional grease to flow through the Zerkometer body and examine the grease to insure that no foreign particles are present in the grease. This will help to assure that the Zerkometer body has no foreign contamination that will enter the bearing after installation.

Hand thread the Zerkometer into the machine housing, being careful not to cross-thread the Zerkometer. Using an 11/16" wrench, tighten the Zerk base into position using no more than 200 inch-pounds torque.

Additional grease may be applied to the fitting at this time, if desired.

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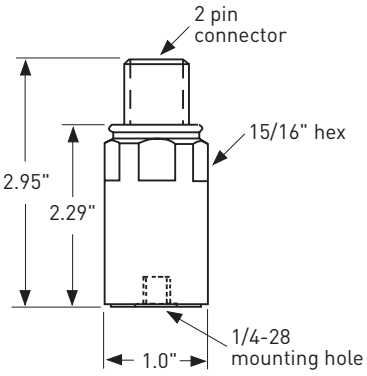
Model 996LD
High sensitivity, leak detection accelerometer

Features
- Low noise floor
- High sensitivity
- Compatible with many commercially available leak detection systems



Dynamic

Sensitivity	12 V/g, ±3 dB
Frequency response, ±3 dB	10 - 4,000 Hz
Resonance frequency, nominal	14 kHz
Acceleration range, nominal	0.10 g peak
Shock limit	1,000 g

Electrical

Supply voltage	12 - 24 VDC
Supply current	2 mA
Bias output voltage	4.8 - 7.5 VDC
Grounding	case grounded
Electrical noise, nominal	
100 Hz	0.08 µg/√Hz
1000 Hz	0.016 µg/√Hz

Environmental

Temperature range	–10°C to 80°C
Sealing	hermetic design

Physical

Case material	316 stainless steel
Mounting	1/4 - 28 tapped hole
Connector	2 pin, MIL-C-5015 style
Mating connector	R6
Recommended cable	J10 / J9T2A

Pin out	Function
A	power/signal
B	common, case

Accessories supplied: Foam sleeve shock protector; SF6 mounting stud

Accessories available: Cable to interface with leak detector systems; magnetic base

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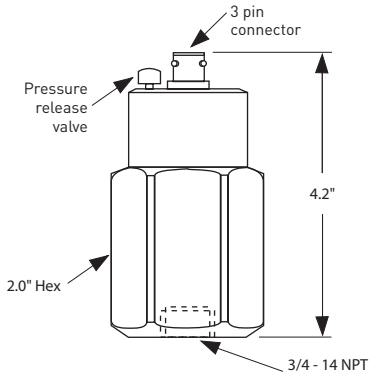
98547 Rev.E.2 12/07

Model H571LD-1A
Leak detection hydrophone



Sensitivity, ±3 dB	–187 dB re 1V/µPa
Amplifier frequency response, ±3 dB	5 Hz to 20 kHz
Powering: voltage source	9 - 15 VDC
current regulating diode	1.5 - 4 mA
Bias voltage	6 VDC
Mounting	3/4 - 14 NPT
Case material	316 stainless steel housing
Output connector	3 pin, MIL-C-26482
Mating connector	Wilcoxon Research R4 (Amphenol PT06A-8-3S (SR))

Connector	Function
Pin A	case
Pin B	common
Pin C	power, signal

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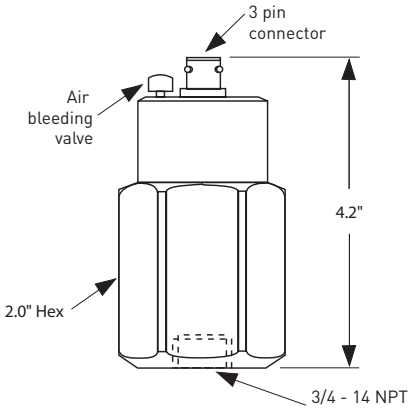
98423 Rev. 4.2 12/07

Model H571LD-2
Leak detection hydrophone



Sensitivity, ±3 dB	–175 dB re 1V/µPa
Amplifier frequency response, ±3 dB	5 Hz to 20 kHz
Powering: voltage source	9 - 15 VDC
current regulating diode	1.5 - 4 mA
Bias voltage	6 VDC
Maximum input pressure	150 PSI
Maximum temp	60°C
Mounting	3/4 - 14 NPT
Case material	316 stainless steel housing
Output connector	3 pin, MIL-C-26482
Mating connector	Wilcoxon Research R4 (Amphenol PT06A-8-3S (SR))

Connector	Function
Pin A	case
Pin B	common
Pin C	power, signal

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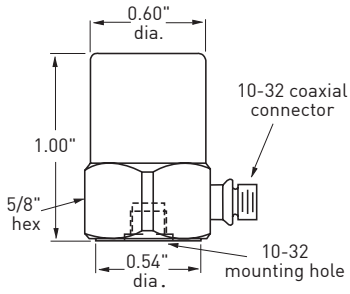
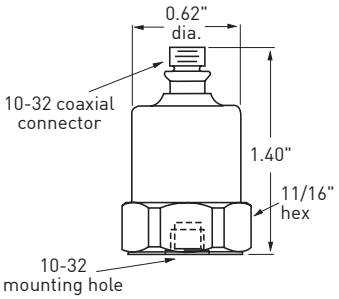
98600 Rev. A.3 12/07

Models 726/726T
Small size piezoelectric accelerometers

Features
- Wide frequency range
- Low noise floor
- Hermetically designed
- Temperature compensated
- Wide dynamic range
- Small size, lightweight
- Reverse wiring protection



Model 726



Model 726T

Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range	80 g peak
Amplitude nonlinearity	1%
Frequency response:	
±5 %	2.0 - 10,000 Hz
±10 %	1.0 - 12,000 Hz
±3 dB	0.6 - 15,000 Hz
Resonance frequency, mounted, nominal	32 kHz
Transverse sensitivity, max.	5% of axial
Temperature response:	
–50°C	–10%
+120°C	+5%

Electrical

Power requirement: voltage source		18-30 VDC
current regulating diode		2 - 10 mA
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 kHz	60 µg
Spectral	10 Hz	8.0 µg/√Hz
	100 Hz	0.8 µg/√Hz
	1,000 Hz	0.3 µg/√Hz
	10,000 Hz	0.2 µg/√Hz
Output impedance, max.		100Ω
Bias output voltage, nominal		12 VDC
Grounding:		
Model 726 (side connector)		case grounded
Model 726T (top connector)		base isolated

Environmental

Temperature range	–50 to 120°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Electromagnetic sensitivity @ 60 Hz	40 µg/gauss
Base strain sensitivity	0.002 g/µstrain

Physical

Weight: Model 726	30 grams
Model 726T	34 grams
Case material	316L stainless steel
Mounting	10-32 tapped hole
Output connector	10-32 coaxial
Mating connector	R1
Recommended cable	J93

Accessories supplied: SF1 mounting stud, calibration data (Level 3)
Accessories available: R1-2-J93-10 cable assembly, magnetic mounting bases, SF5 cementing studs, SF4 isolation mounting bases, power supplies, amplifiers, signal conditioners

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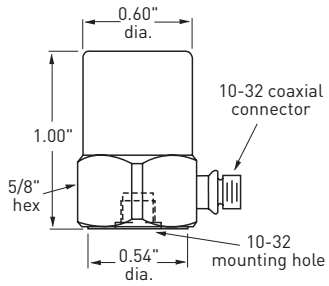
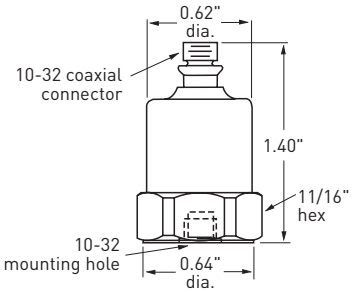
98038 Rev.H.3 12/07

Model 728A/728T
High sensitivity, low-noise accelerometers

Features
- Wide frequency range
- Low noise floor
- Hermetically sealed
- Temperature compensated
- Wide dynamic range
- Small size, light weight
- Miswiring protection



Model 728A



Model 728T

Dynamic

Sensitivity, ±5%, 25 °C	500 mV/g
Acceleration range	15 g peak
Amplitude nonlinearity	1 %
Frequency response	
±5%	3 - 5,000 Hz
±3 dB	1 - 10,000 Hz
Resonance frequency, mounted, nominal	24 kHz
Transverse sensitivity, max.	7 % of axial
Temperature response:	
-50°C	- 10%
+120°C	- 5%

Electrical

Power requirement: voltage source		18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g, nominal.:		
Broadband	2.5 Hz to 25 kHz	30 µg
Spectral	10 Hz	5.0 µg/√Hz
	100 Hz	0.4 µg/√Hz
	1000 Hz	0.1 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage, nominal		10 VDC
Grounding	728A	case grounded
	728T	base isolated

Environmental

Temperature range	-50 to 120 °C
Vibration limit	250 g peak
Shock limit	2500 g peak
Electromagnetic sensitivity @ 60 Hz	20 µg/gauss
Base strain sensitivity	0.002 g/µstrain

Physical

Weight	44 grams
Case material	stainless steel
Mounting	10-32 tapped hole
Output connector	10-32 coaxial
Mating connector	R1
Recommended cable	J93

Accessories supplied: SF1 mounting stud, calibration date (Level 3)
Accessories available: R1-2-J93-10 cable assembly, magnetic mounting bases, SF5 cementing studs, SF4 isolation mounting base, signal conditioners

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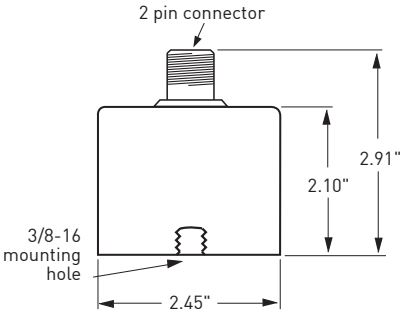
98056 Rev. A.5 12/07

Model 731A
Ultra-quiet, ultra low frequency, seismic accelerometer

Features
- Ultra high sensitivity
- Ultra low-noise electronics for clear signals at sub micro-g levels
- Low frequency capable
- Low pass filtered to eliminate high frequencies
- Reverse wiring protection



Dynamic

Sensitivity, ±10%, 25°C	10 V/g
Acceleration range	0.5 g peak
Amplitude nonlinearity	1%
Frequency response:	
±10%	0.10 - 300 Hz
±3 dB	0.05 - 500 Hz
Resonance frequency	815 Hz
Transverse sensitivity, max.	1% of axial
Temperature response:	
–10°C	–12%
+65°C	+5%

Electrical

Power requirement:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz	0.5 µg
Spectral	2 Hz	0.03 µg/√Hz
	10 Hz	0.01 µg/√Hz
	100 Hz	0.004 µg/√Hz
Output impedance, max.		100Ω
Bias output voltage		9 VDC
Grounding		case isolated

Environmental

Temperature range	–10 to 65°C
Vibration limit	10 g peak
Shock limit	fragile
Electromagnetic sensitivity @ 60 Hz.	20 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.0001 g/µstrain

Physical

Sensing element design	PZT ceramic / flexure
Weight	670 grams
Case material	316L stainless steel
Mounting	3/8 - 16 tapped hole
Output connector	2 pin, MIL-C-5015 style
Mating connector	R6 type
Recommended cabling	J9 / J9T2A

Connector pin	Function
Shell	ground
A	power/ signal
B	common

Note: Special handling required due to sensitivity, wooden protective case included
Accessories supplied: SF7 mounting stud; calibration data (level 3)
Options: Power unit/amplifier P31

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MEGGiTT
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98078 Rev.C.3 12/07

Model 731A/Model P31 system
Seismic accelerometer and power amplifier

Dynamic

Acceleration sensitivity, selectable	10, 100, 1000 v/g
Velocity sensitivity, selectable	0.1, 1, 10 V/in/sec
Vibration range, max.	0.5 G peak
Amplitude nonlinearity	1%

Frequency response:

Filter	100 hz	450 hz	velocity
–10%	0.08 - 70 Hz	0.08 - 300 Hz	– – –
–3Db	0.05 - 100 Hz	0.05 - 450 Hz	0.8 - 150 Hz

Transverse sensitivity, max.	1% Of axial

Electrical

Output impedance	2500 Ω
Recommended load impedance	› 250 kΩ
Maximum output voltage	5 v peak

Noise:

Spectral	2 hz	0.03 µg/√hz
	10 Hz	0.01 µg/√hz
	100 Hz	0.004 µg/√hz

Grounding	case isolated

Output connector:

Model 731A	2 pin, mil-c-5015
Model P31	BNC
Input connector (P31)	twin axial BNC

Power requirements (P31)

Internal batteries	four 9 volt alkaline
Battery life	› 150 hours

Environmental

Temperature range	–10 to 65°C
Vibration limit	10 g peak
Shock limit	fragile
Base strain sensivitiy	0.0001 g/µstrain

Physical

Sensing element design	PZT ceramic / flexure

Weight:

Model 731A seismic accelerometer	670 grams
Model P31 power unit/amplifier	600 grams
Interconnect cable, model 731A to model P31	r6-2t-j9-10

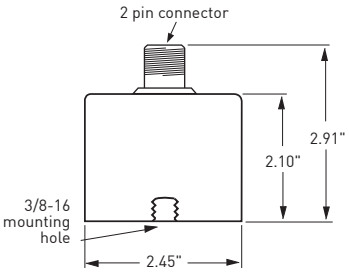
See connections on the back.

Note: Special handling required due to sensitivity

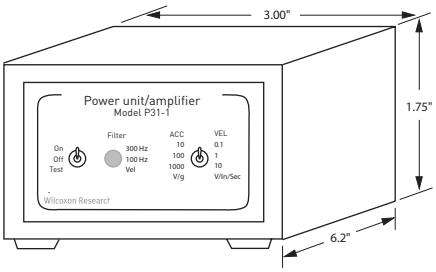
Accessories supplied: SF7 mounting stud; calibration data (level 3)

Features

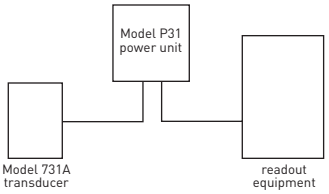
- Ultra high sensitivity
- Ultra low-noise electronics for clear signals at sub micro-g levels
- Low frequency capable
- Low pass filtered to eliminate high frequencies
- ESD protection
- Mis-wiring protection



Model 731A



Model P31



Powering with P31 power unit

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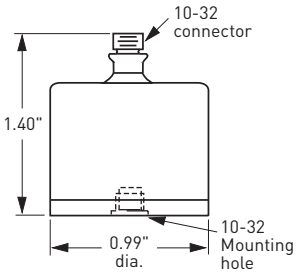
Output	Connector	Function	Cable
731A	shell	case	Shield
	A	power / signal	white
	B	common	black
P31	shell	common	shield
	pin	signal	center conductor

Input	Connector	Function	Cable
P31	shell	ground	shield
	pin	power/signal	white
	socket	common	black

Wilcoxon Research

Model 731-207
Ultra low frequency seismic accelerometer

Features
- Compact construction to fit in tight spaces
- Ultra-high sensitivity
- Ultra low-noise electronics for clear signals at very low vibration levels
- Reverse wiring protection



Dynamic

Sensitivity, ±10%, 25°C	10 V/g
Acceleration range	0.5 g peak
Amplitude nonlinearity	1%
Frequency response, nominal:	
±5%	0.6 - 650 Hz
±10%	0.5 - 850 Hz
±3 dB	0.2 - 1,300 Hz
Resonance frequency, mounted, nominal	2.4 kHz
Transverse sensitivity, max.	1% of axial
Temperature response:	
–0°C	–18%
+80°C	+8%

Electrical

Power requirement: voltage source		18 - 30 VDC
	current regulating diode	2 - 10 mA
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 kHz	2 µg
Spectral	2 Hz	0.28 µg/√Hz
	10 Hz	0.09 µg/√Hz
	100 Hz	0.03 µg/√Hz
Output impedance, max.		500 Ω
Bias output voltage, nominal		10 VDC
Grounding		case grounded

Environmental

Temperature range	0 to 80°C
Vibration limit	50 g peak
Shock limit	250 g peak
Electromagnetic sensitivity @ 60 Hz	20 µg/gauss
Sealing	hermetic
Base strain sensitivity	0.0005 g/µstrain

Physical

Weight	50 grams
Case material	316L stainless steel
Mounting	10-32 UNF
Output connector	10-32 coaxial
Recommeded	J93

Accessories supplied: Calibration data; SF1 mounting stud
Accessories available: R1-2-J93-10 cable assembly, magnetic mounting bases, SF5 cementing studs, SF4 isolation mounting base, signal conditioners

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98069 Rev.C.3 12/07

Wilcoxon Research

Model 731-207R
Radiation resistant, ultra low frequency accelerometer

Dynamic

Sensitivity, ±10%, 25°C	10 V/g
Acceleration range	0.5 g peak
Amplitude nonlinearity	1%
Frequency response, nominal:	
±5%	0.6 - 650 Hz
±10%	0.5 - 850 Hz
±3 dB	0.2 - 1,300 Hz
Resonance frequency, mounted, nominal	2.4 kHz
Transverse sensitivity, max.	1% of axial
Temperature response	
–0°C	–18%
+80°C	+8%

Features

- Compact construction to fit in tight spaces
- Ultra-high sensitivity
- Ultra low-noise electronics for clear signals at very low vibration levels
- Miswiring protection
- Radiation resistant
- Cumalative radiation of 10,000,000 RADS max

Electrical

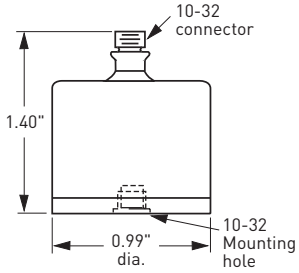
Power requirement:		
Voltage source		18 - 30 Vdc
Current regulating diode		2 - 10 ma
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 khz	2 µg
Spectral	2 Hz	0.28 µg/√hz
	10 Hz	0.09 µg/√hz
	100 Hz	0.03 µg/√hz
Output impedance, max.		500 Ω
Bias output voltage, nominal		10 Vdc
Grounding		base isolated

Environmental

Temperature range	0 to 80°C
Vibration limit	50 g peak
Shock limit	250 g peak
Electromagnetic sensitivity @ 60 Hz	20 µg/gauss
Base strain sensitivity	0.0005 g/µstrain
Sealing	hermetic
Max total radiation	1 x 10^7 RADS

Physical

Weight	77 grams
Case material	316L stainless steel
Mounting	10-32 UNF
Output connector	10-32 coaxial



Accessories supplied: Calibration data (level 3); SF1 mounting stud

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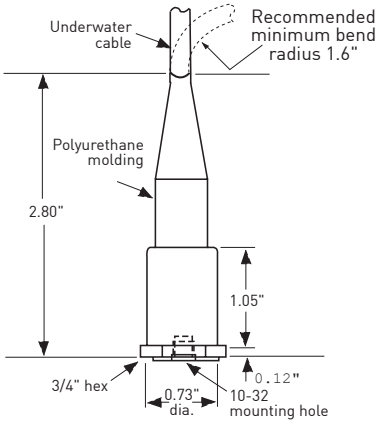
98729 Rev.A.3 012/07

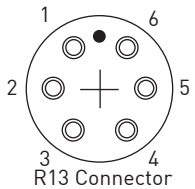
Model 746
Underwater accelerometer

Features
- High sensitivity
- Wide frequency range
- High pressure rating
- Ground isolated-eliminates ground loops
- Reverse wiring protection



Pin assignments	
Pin #	Cable
1	nc
2	shield/common
3	nc
4	nc
5	b+/signal
6	nc

Face side



R13 Connector
(Seacon AWM-6-MP)

Dynamic

Sensitivity, ±5%, 25°C	100 mV/g
Acceleration range[1]	50 g peak
Amplitude nonlinearity	1%
Frequency response:	
±1 dB	2 - 8,000 Hz
±3 dB	1 - 15,000 Hz
Resonance frequency, mounted, nominal	30 kHz
Transverse sensitivity, max.	5% of axial
Temperature response:	
–50°C	–10%
+80°C	+4%

Electrical

Power requirement: voltage source		18 - 30 VDC
current regulating diode[1]		2 - 10 mA
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 kHz	50 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	0.8 µg/√Hz
	1000 Hz	0.2 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage		10, ±2 VDC
Grounding		isolated

Environmental

Hydrostatic pressure	650 psi
Temperature range	–50 to 80°C
Vibration limit	500 g peak
Shock limit	5,000 g peak
Base strain sensitivity	0.005 g/µstrain

Physical

Dynamic weight	45 grams
Case material	titanium
Mounting	10 - 32 tapped hole
Integral cabling	J6, 10 ft.

Connector	Function
Center	power/signal
Shield	common

Notes: [1]To minimize the possibility of signal distortion when driving long cables with high vibration signals, 24 to 30 VDC powering is recommended. The higher level constant current source should be used when driving long cables (please consult Wilcoxon customer service).

Options: Customer specified cable length, connectors, sensitivity, filtering.

Accessories supplied: SF1 mounting stud; calibration data

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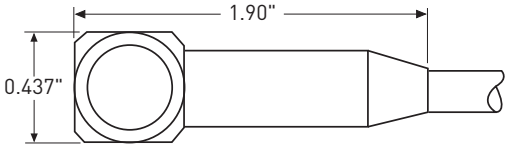
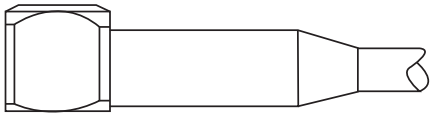
Wilcoxon Research

Model 754
Miniature underwater accelerometer



Top view


Side view

Dynamic

Sensitivity, ±1.5 dB, 25°C	10 mV/g
Acceleration range[1]	250 g peak
Amplitude nonlinearity	1%
Frequency response:	
±1 dB	10 - 15,000 Hz
±3 dB	2 - 25,000 Hz
Resonance frequency, mounted, nominal	60 kHz
Transverse sensitivity, max.	10% of axial
Temperature response	see graph

Electrical

Power requirement: voltage source	18-30 VDC
current regulating diode[1]	2-5 mA
Electrical noise, equiv. g, nominal:	
Broadband 2.5 Hz to 25 kHz	300 µg
Spectral 10 Hz	50 µg/√Hz
100 Hz	4.0 µg/√Hz
1,000 Hz	1.5 µg/√Hz
10,000 Hz	1.0 µg/√Hz
Output impedance, max.	200 Ω
Bias output voltage, nominal	8, ±1.5 VDC
Grounding	case isolated, internally shielded

Environmental

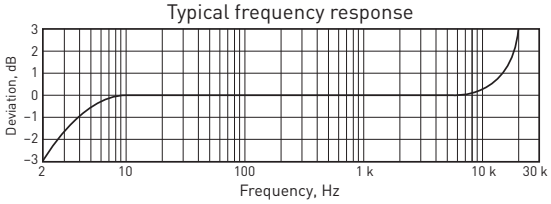
Hydrostatic pressure, max	650 psi
Temperature range	–20 to 90°C
Vibration limit	500 g peak
Shock limit	5000 g peak
Base strain sensitivity	0.01 g/µstrain

Physical

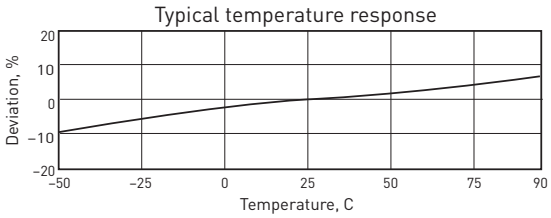
Dynamic weight	4 grams
Case material	titanium
Mounting	adhesive
Integral cabling	J6, 10 ft

Notes: [1] To minimize the possibility of signal distortion when driving long cables with high vibration signals, 24 to 30 VDC powering is recommended. The higher level constant current source should be used when driving long cables (please consult Wilcoxon customer service).

Typical frequency response



Typical temperature response



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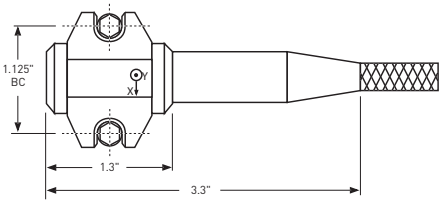
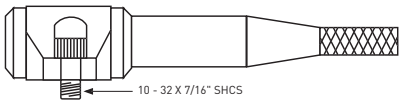
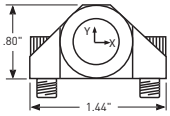
Model 757
Biaxial, low profile, underwater accelerometer

Features
- Rugged
- General purpose underwater accelerometer
- Industrial
- Easy to mount
- Bi-axial measurements







Dynamic

Sensitivity, ±10%, 25°C	100 mV/g
Acceleration range	50 g peak
Amplitude nonlinearity	1%
Frequency response:	
Both channels, ±10%	2 - 2,000 Hz
Transverse sensitivity, max.	5% of axial
Temperature response:	
–20°C	–5%
+90°C	+5%

Electrical

Power requirement: voltage source		18 - 30 VDC
current regulating diode		2 - 10 mA
Electrical noise, equiv. g, nominal:		
Broadband	2.5 Hz to 25 kHz	100 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	1 µg/√Hz
	1000 Hz	0.5 µg/√Hz
Output impedance, max.		100 Ω
Bias output voltage, nominal		12 VDC
Grounding		case isolated, internally shielded

Environmental

Temperature range	–50 to 80°C
Hydrostatic pressure, max.	650 psi
Vibration limit	500 g peak
Shock limit	5000 g peak
Electromagnetic sensitivity, equiv. g.	100 µg/gauss
Base strain sensitivity	0.002 g/µstrain

Physical

Weight	110 grams
Case material	316L stainless steel
Mounting	two 10-32 x 7/16 SHCS on 1.125 bolt circle
Recommended cable	J81S, 10 ft., stainless steel braid

Connector	Function
White	x
Black	y
Shield	common

Accessories supplied: Two 10-32 x 7/16 SHCS; calibration data
Accessories available: Power supplies, amplifiers, signal conditioners

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98129 Rev. B.3 12/07

Model H505L-2-XXX
General purpose, self-amplified hydrophone

The H505L hydrophone is designed as a small, versatile, self-amplified hydrophone for general purpose applications to a wide variety of underwater acoustic measurements. Ruggedness, low cost and an ultra low-noise internal amplifier are prime features of this unit. The internal amplifier eliminates triboelectric cable noise, connector contamination problems and the requirement for an expensive in-line amplifier.

The hydrophone and cable entry are completely encapsulated in polyurethane. This alleviates water intrusion caused by cathodic action. The assembly uses pre-aged piezoelectric (PZT) sensing elements.

Applications for the H505L include underwater biological studies, ship noise studies, pump and machinery studies and monitoring of underwater ordnance.

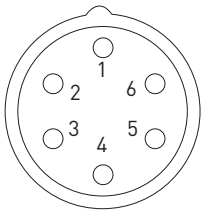
Output sensitivity	–160 dB re 1V/µPa
Amplifier gain	10 dB
Typical spectrum noise:	
at 10 Hz	54 dB re 1µPa/√Hz
at 100 Hz	34 dB re 1µPa/√Hz
at 1 kHz	15 dB re 1µPa/√Hz
at 10 kHz	6 dB re 1µPa/√Hz
Frequency response, ±3dB	20 to 10,000 Hz
Omnidirectional	20 to 5,000 Hz
Maximum operating depth	250 meters
Output impedance	200 ohms
Supply voltage	24 VDC
Current	10 mA max
Cable[1]	3 conductor, shielded, 10 meters standard
Jacket material[1]	polyurethane, 0.285" dia.

Connector	Function
White	n/c
Red	signal/power
Black	common
Shield	internal housing

Notes: [1] Standard cable for units supplied with optional connectors is 5 conductor shielded, polyurethane, 0.25" dia., 10 foot length
Options: Customer specified cable length

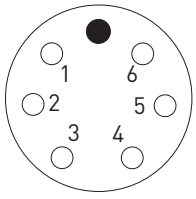
Optional connector pinout		
Pin	Function	Wire color
1	case	shield
2	common	black
3	B+, signal out	red
4	N.C.	green
5	N.C.	white
6	N.C.	yellow

R12 pinout

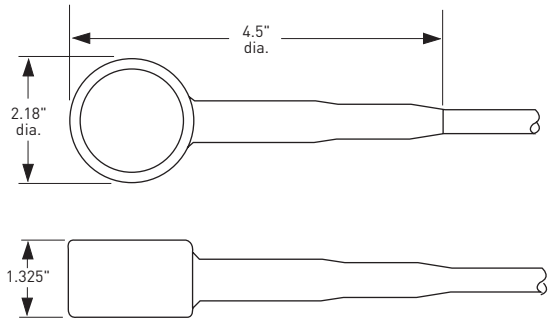


Face view

R13 pinout



Face view



Export Classification: ECCN 6A001

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98566 Rev. A.2 12/07

Model 991D
Internally amplified, helicopter accelerometer

Dynamic

Sensitivity[1], ±5%, 25°C	40 mV/g
Acceleration range	40 g peak
Amplitude nonlinearity	1%
Frequency response:	
±5%	2.0 - 4,000 Hz
±10%	1.0 - 6,000 Hz
±3 dB	0.5 - 12,000 Hz
Resonance frequency, mounted, nominal	20 kHz
Transverse sensitivity, max.	7% of axial
Temperature response:	
–50°C	+2%
+120°C	-10%

Electrical

Power requirement: voltage source	9 VDC
Electrical noise, equiv. g, nominal:	
Broadband 2.5 Hz to 25 kHz	75 µg
Spectral 10 Hz	7.0 µg/√Hz
100 Hz	1.3 µg/√Hz
1000 Hz	0.9 µg/√Hz
Output impedance, max	2,400 Ω
Bias output voltage	3.5, ±0.5 VDC
Grounding	base isolated

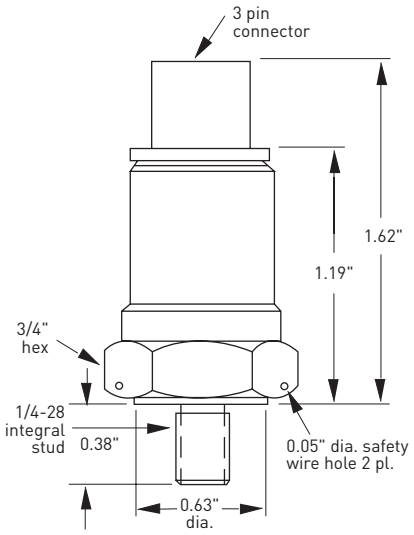
Environmental

Temperature range	–50 to 120°C
Vibration limit	250 g peak
Shock limit	1,000 g peak
Electromagnetic sensitivity, equiv. g.	40 µg/gauss
Base strain sensitivity	0.002 g/µstrain

Physical

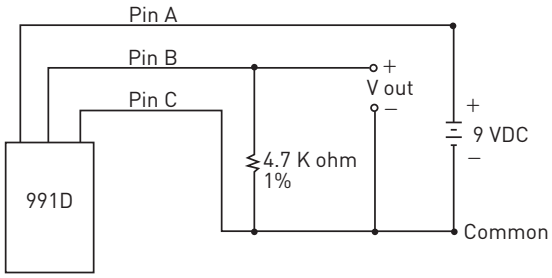
Weight	54 grams
Case material	stainless steel
Mounting	1/4-28 x 0.38 integral stud
Output connector	3 pin, MIL-C-26482 style
Mating connector	R4-type
Cable	2 conductor shielded

Connector	Function
A	9 VDC
B	signal out
C	common



Notes: [1] As measured across a 4.7 kΩ load (see calibration powering diagram) sensitivity is 60 mV/g as measured in operating system

Calibration powering diagram



Note: This powering method is used for calibration purposes ONLY.

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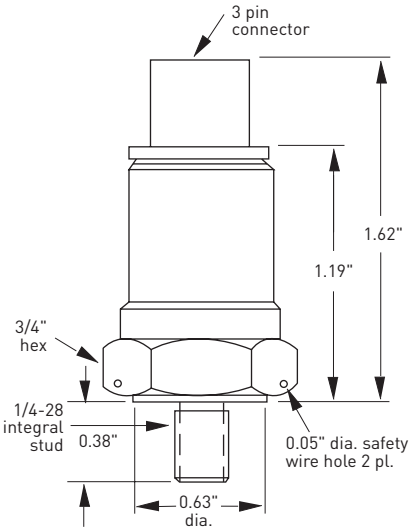
Wilcoxon Research

Model 991D-1
Internally amplified, helicopter accelerometer



Dynamic

Sensitivity, ±5%, 25°C	20 mV/g
Acceleration range[1]	250 g peak
Amplitude nonlinearity	1%
Frequency response:	
±5%	1 - 4,000 Hz
±10%	0.7 - 6,000 Hz
±3 dB	0.4 - 12,000 Hz
Resonance frequency, mounted, nominal	20 kHz
Transverse sensitivity, max.	5% of axial
Temperature response:	
-50°C	+5%
+120°C	-10%

Electrical

Power requirement: voltage source[1]	18 - 30 VDC
current regulating diode[2]	2 - 10 mA
Electrical noise, equiv. g, nominal:	
Broadband, 2.5 Hz to 25 kHz	1,500 µg/√Hz
Spectral 10 Hz	20.0 µg/√Hz
100 Hz	11.0 µg/√Hz
1000 Hz	8.0 µg/√Hz
Output impedance, max.	100 Ω
Bias output voltage, nominal	12 VDC
Grounding	base isolated

Environmental

Temperature range	–50 to 120°C
Vibration limit	250 g peak
Shock limit	1,000 g peak
Electromagnetic sensitivity, equiv. g.	190 µg/gauss
Base strain sensitivity	0.005 g/µstrain

Physical

Weight	54 grams
Case material	stainless steel
Mounting	1/4-28 x 0.38 integral stud
Output connector	3 pin, MIL-C-26482 style
Cabling: Mating connector	R4-type
Cable	2 conductor shielded

Connector	Function
Pin A	case
Pin B	common
Pin C	signal

Notes: [1] To minimize the possibility of signal distortion for high vibration signals, 24 to 30 VDC powering is recommended.
[2] The higher level constant current sources should be used when driving long cables (please consult Wilcoxon customer service). A maximum current of 6 mA is recommended for operating temperatures in excess of 100°C.

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MEGGiTT
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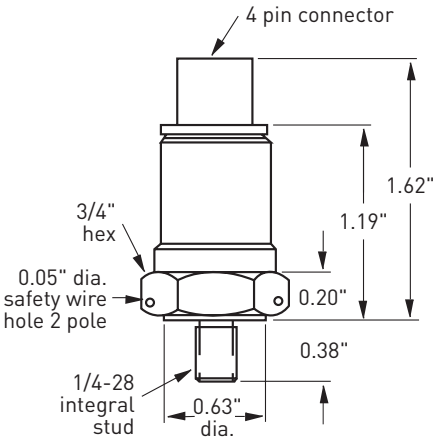
Model 991V

Internally amplified velocity sensor

Features

- Internally integrated to velocity
- Compatible with current helicopter monitoring systems
- Mechanical & thermal isolation
- Low noise floor



Dynamic

Sensitivity, ±10%, 25°C	20 mV/in/sec
Velocity range	400 in/sec peak
Amplitude nonlinearity	1%
Frequency response:	
±10%	5.0 - 4,000 Hz
±3 dB	2.5 - 7,000 Hz
Resonance frequency, mounted, nominal	20 kHz
Transverse sensitivity, max.	5% of axial
Temperature response:	
-50°C	-5%
+120°C	+10%

Electrical

Power requirement: current draw		‹0.5 mA
Electrical noise, equiv. in/sec, nominal:		
Broadband	2.5 Hz to 25 kHz	1,500 µin/sec
Spectral	10 Hz	100 µin/sec/√Hz
	100 Hz	9 µin/sec/√Hz
	1000 Hz	3 µin/sec/√Hz
Output impedance, max.		100 Ω
Grounding		base isolated

Environmental

Temperature range	–50 to 120°C
Vibration limit	250 g peak
Shock limit	1,000 g peak
Electromagnetic sensitivity, equiv. in/sec.	300 µin/sec/gauss
Base strain sensitivity	0.004 in/sec/µstrain

Physical

Weight	55 grams
Case material	stainless steel
Mounting	1/4-28 x 0.38 integral stud
Output connector	MIL-C-26482 style
Cabling: Mating connector	R4V
Recommended cable	4 conductor shielded

Connector	Function
Pin A	-9VDC
Pin B	common
Pin C	+9VDC
Pin D	signal

Accessories available: Mating connector

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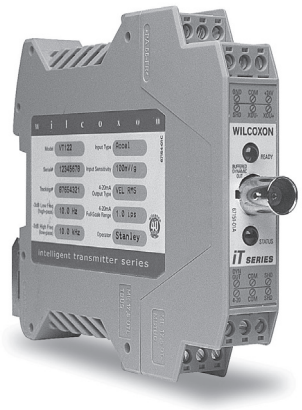
98289 Rev.F.2 12/07

Model iT100, iT200 Series
4-20 mA vibration transmitter modules



Features
- Slim 17.5mm case
- Reverse wiring protection
- ESD protection
- Front panel BNC for dynamic signal output
- Communicates with other iT Series modules through intergrated communication bus

Benefits
- Dynamic signal available for portable data collectors (BNC) or hard wired on-line systems (terminals)
- Units can be daisy chained providing mutiple 4-20 mA output from a single sensor

The iT Series vibration transmitter module operates from a 24 Volt DC (nominal) power supply. They accept input directly from IEPE-type sensors. The module then processes the signal and produces an output 4-20 mA loop current proportional to the overall in-band vibration. The input dynamic vibration signal is buffered and presented as an output at the BNC connector and on one set of terminals. The standard 4-20 mA loop output signal is usually wired to a Programmable Logic Controller (PLC) or a Distributed Control System (DCS).

Wiring

Terminal designations

P1	+24V	Positive power input for iT module
	COM	Common for power input
	GND	Earth ground connection (to ground iT module)
P2	XDU+	Sensor power/signal Input
	XDU-	Sensor common Input
	SHD	Sensor shield wiring termination
P3	DYN OUT	Dynamic signal out
	COM	Common of dynamic signal out
	SHD	Shield point termination for dynamic out
P4	4-20	4-20 mA loop return signal
	COM	Common reference for 4-20 mA return
	SHD	Shield point termination for loop wiring

Front Panel

BNC connector	Output BNC connection for buffered dynamic signal (for data collector)
Green LED	"On" indicates 24 Volt power applied and Sensor connection OK "Off" indicates no 24 Volt power applied or unit not ready "Flashing" indicates BOV out of OK range (5V to 18V)
Red LED	"Blinking" every 2 seconds, normal operation "ON" error condition, indicates signal clipping or internal circuit failure

Output, 4-20 mA loop current

Full scale, ±2%	see chart on back
Output type	peak (equivalent) or true RMS, true peak or true peak - peak
Frequency response, without filtering, -3dB:	
Acceleration	0.3 Hz to 20 kHz
Velocity	1.0 Hz to 10 kHz[4]
Repeatability	2%
Maximum 4-20mA loop load resistance[1]	2%
Zero (4mA) accuracy	±0.25 mA
Reading accuracy	±2% of full scale
High-pass filtering, 2-pole, pre-set[2]	see chart on back
Low-pass filtering, 8-pole, pre-set[2]	see chart on back
Temperature offset, maximum	0.1%/°C
Turn-on time	120 seconds

Output, buffered dynamic

Gain, RTI sensor	1.0 ± 2%
Noise RTO, broadband, 1Hz - 10 kHz, RMS	≤ 0.0001 volts
Frequency response: amplitude (±3dB)	≤0.3 Hz to ≥100 kHz
Phase shift (at 1 kHz)	0° ± 1°
Output type	AC- AC/DC coupled

Input

Sensor types	IEPE accelerometers and IEPE PiezoVelocity transducers
Sensor sensitivities accepted:	
Accelerometer	10 mV/g, 100 mV/g, 500 mV/g
PiezoVelocity	10 mV/ips, 100 mV/ips, 500 mV/ips
Sensor powering:	
Open circuit voltage	Vin - 2 ±1 Volts
Constant-current	3.6 mA ±20%
Maximum dynamic signal input, for linear response[3]	±7 volts peak

Environmental

Power: voltage (Vin)	24 ±4 volts, DC
absolute maximum voltage	32 volts DC
current draw	≤130 mA
Operating temperature	-40°C to +85°C
Humidity, non-condensing	≤ 95%
Altitude limit, operating	3,000 meters

Physical

Mounting	snap fit 35 mm DIN rail
Width	17.5 mm (0.70")
Depth, front of BNC to back of DIN rail	127 mm (4.98")
Height	100 mm (3.90")

Notes: [1] Determined at powering voltage of 24 Volts
[2] In "Manual Set" mode the filters are continuously variable. LF: 2 Hz to 1 kHz, HF: 200 Hz to 20 kHz
[3] Under all conditions the input vibration should not exceed 50ips
[4] Limited by sensor type, see ordering information matrix

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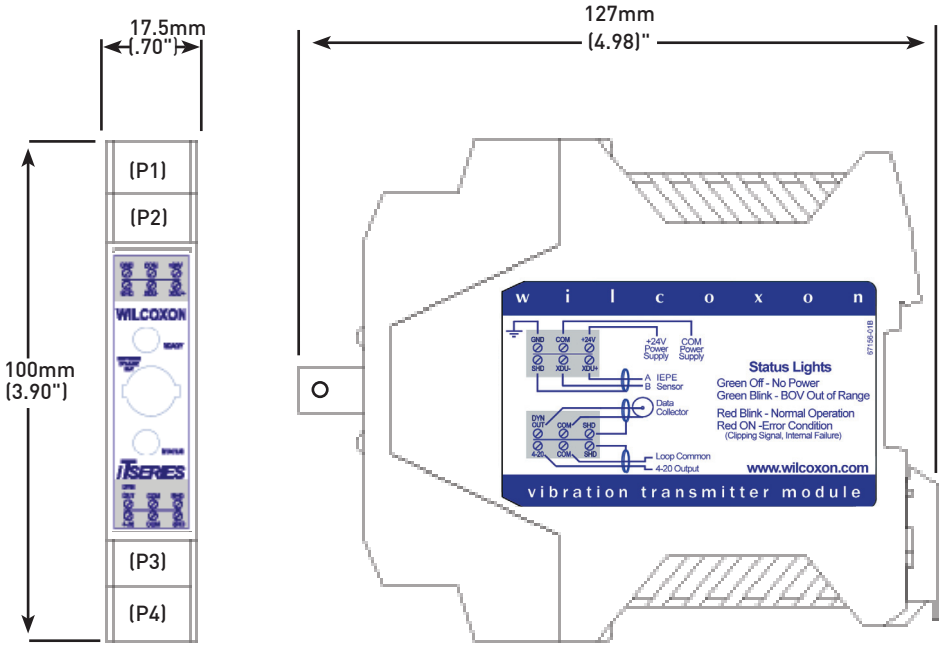
Model iT Series
4-20 mA vibration transmitter modules



Ordering information

iT □□□ - F □□ - S□□□ - L □□□□.□ - H □□□□□ (displayed on side label)

iT	*iT* Model type
111	Acceleration input, acceleration 4-20 mA output; g-peak
112	Acceleration input, acceleration 4-20 mA output; g-RMS
113	Acceleration input, acceleration 4-20 mA output; g-true peak
114	Acceleration input, acceleration 4-20 mA output; g-true peak - peak
121	Acceleration input, velocity 4-20 mA output; ips-peak
122	Acceleration input, velocity 4-20 mA output; ips-RMS
123	Acceleration input, velocity 4-20 mA output; ips-true peak
124	Acceleration input, velocity 4-20 mA output; ips-true peak -peak
221	PiezoVelocity (PVT) input, velocity 4-20 mA output; ips-peak
222	PiezoVelocity (PVT) input, velocity 4-20 mA output; ips-RMS
223	PiezoVelocity (PVT) input, velocity 4-20 mA output; ips- true peak
224	PiezoVelocity (PVT) input, velocity 4-20 mA output; ips-true peak-peak
231	PiezoVelocity (PVT) input, displacement 4-20 mA output; mil-peak
232	PiezoVelocity (PVT) input, displacement 4-20 mA output; mil-RMS
233	PiezoVelocity (PVT) input, displacement 4-20 mA output; mil-true peak
234	PiezoVelocity (PVT) input, displacement 4-20 mA output; mil-true peak-peak

F	Full-scale output		
	Acceleration	Velocity	Dispalcement
05	5g	0.5 ips	
10	10 g	1.0 ips	10 mil
20	20 g	2.0 ips	20mil
25			25 mil
30	30 g	3.0 ips	
50	50 g	5.0 ips (S100 only)	
99			100 mil

S	Input Sensor Sensitivity	
	Accelerometers	PiezoVelocity Transducer PVT®
010	10 mV / g	10mV/ips
100	100 mV / g	100mV/ips
500	500 mV / g	500 mV/ips

L	Low frequency corner (high-pass)
0000.3	0.3 Hz (acceleration models only)
0001.0	1 Hz (lowest freq. velocity or displacement, S > 500)
0002.0	2 Hz (lowest freq. velocity or displacement, S > 100)
0005.0	5 Hz (lowest freq. velocity or displacement, S > 010)
0010.0	10 Hz
0020.0	20 Hz
0030.0	30 Hz
0050.0	50 Hz
0080.0	80 Hz
0100.0	100 Hz
0200.0	200 Hz
0300.0	300 Hz
0500.0	500 Hz
1000.0	1000 Hz

H	High frequency corner (low-pass)
00200	200 Hz
00300	300 Hz
00500	500 Hz
00800	800 Hz
01000	1000 Hz
02000	2000 Hz (highest frequency for displacement models)
03000	3000 Hz
05000	5000 Hz (highest frequency for velocity models)
10000	10000 Hz (highest frequency for true peak or true peak - peak)
20000	20000 Hz (acceleration models only)

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Model iT401
4-20mA alarm module

The iT401 is the first alarm module designed to work with any 4-20mA loop-powered device and/or the iT Series sensor signal-conditioning modules, providing easily-programable relay activation for use in condition-based monitorinng or process control.

Digital technology, along with simple face-panel push-buttons and a bright digital display means never having to open the unit to alter setpoints. Memory allows user to decide to keep changes permanently, or restore manufacturer defaults.

Features

- 35 mm DIN rail mount
- Front-panel tactile membrane switches
- Front-panel 7-segment LED displays
- TBUS connection to iT Series modules
- Digital processing
- Relays have over 2,000 VAC isolation
- Mounts adjacent to iT Series transmitter modules
- External alarm contacts for signal or BOV faults
- Alternate direct 4-20mA signal input

Benefits

- No need to make external wiring connections to other iT Series modules
- Front-panel switches give access to all settings
- No need to open case to change alarm settings
- Alarm relays can directly control AC or DC loads
- Relay high voltage isolation protects module circuits
- Front panel digital display of input loop level during running conditions
- Front panel digital display of alarm setpoints during programming setup
- Can be used with any 4-20mA loop signal or sensor
- Has capability to activate/reset any relay based on errors (such as loss of 4-20mA signal or iT Series communiction)
- LED displays operate faster than LCD(liquid-crystal) displays, are brighter, and operate over entire industrial temperature range

Input

Front panel push buttons:

Mode/reset	controls mode for programming or reset of latched relays
Increase/decrease	changes programming parameters
Reset input, terminal connection	contact closure for reset of latched relays

Input signal:

TBUS connector	direct connect to vibration transmitter
4-20mA input	uses signal from any 4-20mA source
Loop load	247.5 ± 5%Ω

Output

Alarm relay contacts, 1 form-C	(3) alarm relays
Alarm relay function	latching or non-latching
Relay contact load:	
@70°C (resistive)	8 Amp, 250VAC/30VDC
@85°C (resistive)	5 Amp, 250VAC/30VDC
Inductive	1/3 HP, 125VAC
Alarm trip (each alarm)	high or low setpoint[1]
Alarm action delay (each alarm)	0 to 99 seconds
Alarm setpoint (each alarm):	
Vibration signal	0 to 99% of full scale, in 1% increments
Bias voltage	0 to 18V in 1V Steps[4]
Redundant 4-20mA output	2mA to 22mA[4]

Physical

Mounting	35 mm DIN "T" rail
Width	22.5 mm
Depth, front of panel to back of DIN rail	127 mm
Height	100 mm
Front panel switches	tactile membrane
Front panel digital display	dual 7-segment yellow LED, 0.3"
Front panel alarm LED display	high (red)[1], low (yellow)[1], BOV (orange)[4]
Front panel connectors	4-position removable screw terminal plugs

Environmental

Operating temperature	-40°C to 85°C
Humidity, maximum	95% RH, non-condensing
Altitude, above seal level, maximum	3,000 meters (10,000 feet)
Power requirements:	
Voltage	24 VDC nominal[2]
Current, maximum	150 mA[3]

Accessories supplied: (1) iT032 TBUS connector for iT401 module
(4) iT042 4-position wire connectors

Optional accessories: iT042 4-position spare wire connector for iT401module
iT033, iT034, iT035 TBUS (power) wiring connectors for use with non-iT 100/200/300 series transmitter modules

See back for notes

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Notes:

[1] The three front panel alarm status LED displays are tri-color, red, yellow and orange; are illuminated when that alarm is "On" with color indicating whether it was set as a" high" alarm, "low" alarm, or BOV alarm.

[2] Power for the iT401 is supplied via TBUS connector inside DIN-mount from either iT Series transmitter (using iT031 and iT032) or external power supply (using iT032 and iT033/034/035 connectors).

[3] Current draw is determined at 24 Volts DC power

[4] When used with an iT Series transmitter module

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iT501 Communication Module
RS-232 serial interface

Features
- Digital serial communication using RS232
- 9600 Baud communication rate
- Connects one iT100 Series vibration transmitter to computer
- Daisy-chain of single RS232 type serial connection
- Built-in temperature sensor
- Communication indicators

Benefits
- Remote data availability for monitoring
- No need for RS485 interface for multiple module connections
- Use a standard computer serial port
- Communication indicator lights provide visual status of properly connected modules and active communication

The iT501 Communication Module allows the user the ability to digitally communicate with the iT100/200/300 Series of vibration transmitter modules. The communication uses a "standard" RS232 serial communication protocol. Computers or other digital devices can interface to the iT Series of vibration transmitters to request data using a typical RS232 serial port.

Multiple iT501 modules can be "daisy-chained" such that a single RS232 serial port can be used to communicate with multiple iT501's.

Each iT501 interfaces to a single iT Series vibration transmitter module. Multiple transmitter modules cannot be connected to a single iT501. However, multiple iT501 units can be daisy-chained. The communication baud rate is 9600 baud. This will allow communication using the RS232 serial interface over 300 feet of cable.

Computer connection (PC)

Communication type	RS232 serial, asynchronous[1]
Baud rate	9600
Byte format:	
Bits/Byte	8
Stop bits	1
Parity	none

Repeater connection (iT)

Communication type	RS232 serial, asynchronous[1]
Byte format:	
Bits/Byte	8
Stop bits	1
Parity	none
iT501 in daisy-chain	8, maximum

Electrical

Power requirements: voltage	12 VDC min, 30 VDC max
current	25 mA, typical
Turn on time	3 seconds
Connectors	4, on front
TBUS	5-pin, on rear of module[2]

Environmental

Temperature	–40 to 85°C
Humidity	95%, non-condensing

Physical

Case	35 mm DIN rail mounting
Wide (DIN rail width)	17.5 mm
Front panel communication LED indicators	TBUS, PC IT

Connection	Function
TX	transmit data
RX	receive data
COM	circuit common

Notes: [1] Asynchronous serial communications connect the TX (transmit) of one device to the RX (receive) of the other device and the common connects directly.

[2] The TBUS interfaces the iT501 to the iT Series vibration transmitter modules. It is the only method to connect the iT501 to a transmitter.

See back for diagram and drawing

RoHS Compliant

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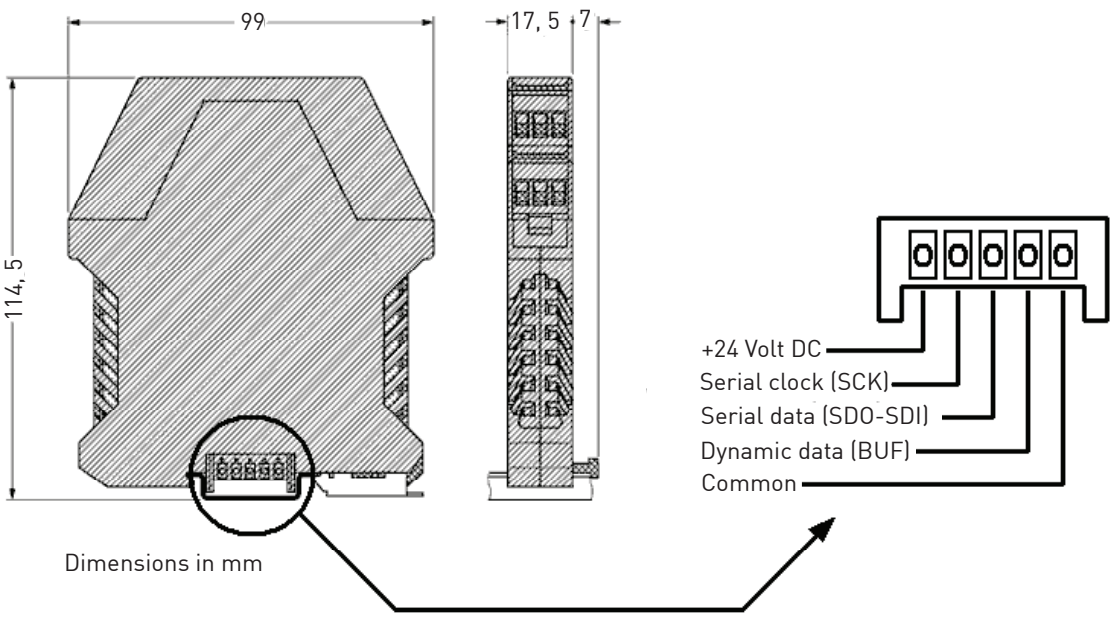

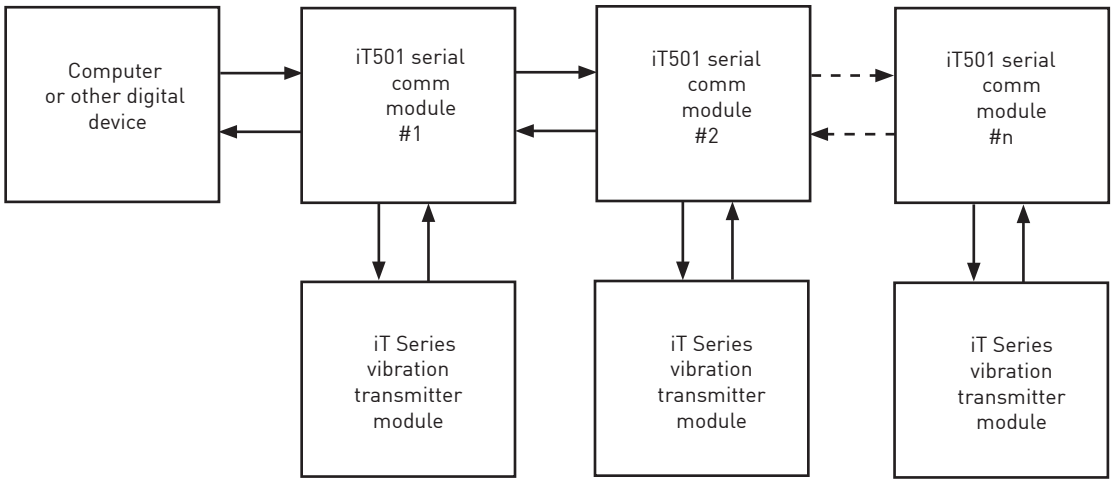

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Sensor selection guide

Why monitor vibration?

Global competition and pressure on corporate performance makes productivity a primary concern for any business. Machinery vibration monitoring programs are effective in reducing overall operating costs of industrial plants. Vibrations produced by industrial machinery are vital indicators of machinery health. Machinery monitoring programs record a machine's vibration history. Monitoring vibration levels over time allows the plant engineer to predict problems before serious damage occurs. Machinery damage and costly production delays caused by unforeseen machinery failure can be prevented. When pending problems are discovered early, the plant engineer has the opportunity to schedule maintenance and reduce downtime in a cost effective manner. Vibration analysis is used as a tool to determine machine condition and the specific cause and location of machinery problems. This expedites repairs and minimizes costs.

Common vibration sensors

Critical to vibration monitoring and analysis is the machine-mounted sensor. Three parameters representing motion detected by vibration monitors are displacement (in inches), velocity (in inches per second), and acceleration (in g's). These parameters are mathematically related and can be derived from a variety of motion sensors. Selection of a sensor proportional to displacement, velocity or acceleration depends on the frequencies of interest and the signal levels involved. Figure 1 shows the relationship between velocity and displacement versus constant acceleration. Sensor selection and installation is often the determining factor in accurate diagnoses of machinery condition.

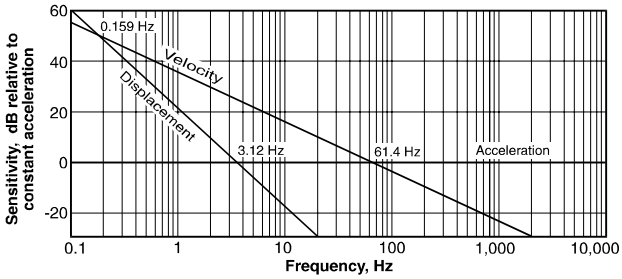

Figure 1. The Relationship of Velocity and Displacement to Acceleration

Displacement sensors

Displacement sensors are used to measure shaft motion and internal clearances. Monitors have used non-contact proximity sensors such as eddy probes to sense shaft vibration relative to

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bearings or some other support structure. These sensors are best suited for measuring low frequency and low amplitude displacements typically found in sleeve bearing machine designs. Piezoelectric displacement transducers (doubly integrated accelerometers) have been developed to overcome problems associated with mounting non-contact probes, and are more suitable for rolling element bearing machine designs. Piezoelectric sensors yield an output proportional to the absolute motion of a structure, rather than relative motion between the proximity sensor mounting point and target surface, such as a shaft.

Velocity sensors

Velocity sensors are used for low to medium frequency measurements. They are useful for vibration monitoring and balancing operations on rotating machinery. As compared to accelerometers, velocity sensors have lower sensitivity to high frequency vibrations. Thus, they are less susceptible to amplifier overloads. Overloads can compromise the fidelity of low amplitude, low frequency signals. Traditional velocity sensors use an electromagnetic (coil and magnet) system to generate the velocity signal. Now, hardier piezoelectric velocity sensors (internally integrated accelerometers) are gaining in popularity due to their improved capabilities. A comparison between the traditional coil and magnetic velocity sensor and the modern piezoelectric velocity sensor is shown in table 1.

	Coil & Magnet Velocity Sensor	Piezoelectric Velocity Sensor
Flat Frequency Response		
20 - 1,500 Hz	Yes	Yes
2 - 5,000 Hz	No	Yes
Phase Fidelity		
2 - 5,000 Hz	Poor	Excellent
Low Off-Axis Sensitivity	No	Yes
Reduced Noise at		
High Frequencies	No	Yes
Linearity	Good	Good
Mounting in Any Orientation	No	Yes
Operation to 120□C	Yes	Yes
EMI Resistance	Poor	Excellent
Mechanical Durability	Fair	Excellent

Table 1. Electromagnetic Velocity Sensors vs. Piezoelectric Velocity Sensors

Accelerometers

Accelerometers are the preferred motion sensors for most vibration monitoring applications. They are useful for measuring low to very high frequencies and are available in a wide variety of general purpose and application specific designs. The piezoelectric accelerometer is unmatched for frequency and amplitude range. The piezoelectric sensor is versatile, reliable and the most popular vibration sensor for machinery monitoring.

Piezoelectric sensors

The rugged, solid-state construction of industrial piezoelectric sensors enables them to operate under most harsh environmental conditions. They are unaffected by dirt, oil, and most chemical atmospheres. They perform well over a wide temperature range and resist damage due to severe shocks and vibrations. Most piezoelectric sensors used in vibration monitoring today contain internal amplifiers.

The piezoelectric element in the sensor produces a signal proportional to acceleration. This small acceleration signal can be amplified for acceleration measurements or converted (electronically integrated) within the sensor into a velocity or displacement signal. The piezoelectric velocity sensor is more rugged than a coil and magnet sensor, has a wider frequency range, and can perform accurate phase measurements.

Piezoelectric materials

The two basic piezoelectric materials used in vibration sensors today are synthetic piezoelectric ceramics and quartz. While both are adequate for successful vibration sensor design, differences in their properties allow for design flexibility. For example, natural piezoelectric quartz has lower charge sensitivity and exhibits a higher noise floor when compared to the modern "tailored" piezoceramic materials. Most vibration sensor manufacturers now use piezoceramic materials developed specifically for sensor applications. Special formulations yield optimized characteristics to provide accurate data in extreme operating environments. The exceptionally high output sensitivity of piezoceramic material allows the design of sensors with increased frequency response when compared to quartz.

Much has been said of the thermal response of quartz versus piezoceramics. Both quartz and piezoceramics exhibit an output during a temperature change (pyroelectric effect) when the material is not mounted within a sensor housing. Although this effect is much lower in quartz than in piezoceramics, when properly mounted within the sensor housing the elements are isolated from fast thermal transients. The difference in materials then becomes insignificant. The dominant thermal signals are caused by metal case expansion strains reaching the base of the crystal. These erroneous signals are then a function of the mechanical design rather than sensing material (quartz or piezoceramic). Proper sensor designs isolate strains and minimize thermally induced signals. (See the section "Temperature range.")

High quality piezoceramic sensors undergo artificial aging during the production process. This ensures stable and repeatable output characteristics for long term vibration monitoring programs. Theoretical stability advantages of quartz versus ceramic designs are eliminated as a practical concern.

Development of advanced piezoceramics with higher sensitivities and capability to operate at higher temperatures is anticipated.

Choosing an industrial sensor

When selecting a piezoelectric industrial vibration sensor (acceleration, velocity, or displacement), many factors should be considered so that the best sensor is chosen for the application. The user who addresses application specific questions will become more familiar with sensor requirements.

Typical questions include:

- What is the vibration level?
- What is the frequency range of interest?
- What is the temperature range required?
- Are any corrosive chemicals present?
- Is the atmosphere combustible?
- Are intense acoustic or electromagnetic fields present?
- Is there significant electrostatic discharge (ESD) present in the area?
- Is the machinery grounded?
- Are there sensor size and weight constraints?

Other questions must be answered about the connector, cable, and associated electronics:

- What cable lengths are required?
- Is armored cable required?
- To what temperatures will the cable be exposed?
- Does the sensor require a splash-proof connector?
- What other instrumentation will be used?
- What are the power supply requirements?

Primary sensor considerations

Two of the main parameters of a piezoelectric sensor are the sensitivity and the frequency range. In general, most high frequency sensors have low sensitivities, and conversely, most high sensitivity sensors have low frequency ranges. It is

therefore necessary to compromise between the sensitivity and the frequency response.

The sensitivity range

The sensitivity of industrial accelerometers typically ranges between 10 and 100 mV/g; higher and lower sensitivities are also available. To choose the correct sensitivity for an application, it is necessary to understand the range of vibration amplitude levels to which the sensor will be exposed during measurements.

As a rule of thumb, if the machine produces high amplitude vibrations (greater than 10 g rms) at the measurement point, a low sensitivity (10 mV/g) sensor is preferable. If the vibration is less than 10 g rms, a 100 mV/g sensor should generally be used. In no case should the peak g level exceed the acceleration range of the sensor. This would result in amplifier overload and signal distortion, therefore generating erroneous data. Higher sensitivity accelerometers are available for special applications, such as low frequency/low amplitude measurements. In general, higher sensitivity accelerometers have limited high frequency operating ranges. One of the excellent properties of the piezoelectric sensor is its wide operating range. It is important that anticipated amplitudes of the application fall reasonably within the operating range of the sensor. Velocity sensors with sensitivities from 20 mV/in/sec up to 500 mV/in/sec are available. For most applications, a sensitivity of 100 mV/in/sec is satisfactory.

Currently, the only piezoelectric displacement sensor known available, is the newly developed Wilcoxon Research model 916VD which has a sensitivity of 10 V/in.

The frequency range

In order to select the frequency range of a piezoelectric sensor, it is necessary to determine the frequency requirements of the application. The required frequency range is often already known from vibration data collected from similar systems or applications. The plant engineer may have enough information on the machinery to calculate the frequencies of interest. Sometimes the best method to determine the frequency content of a machine is to place a test sensor at various locations on the machine and evaluate the data collected.

The high frequency range of the sensor is constrained by its increase in sensitivity as it approaches resonance. The low frequency range is constrained by the amplifier roll-off filter, as shown in figure 2. Many sensor amplifiers also filter the high end of the frequency range in order to attenuate the resonance amplitude. This extends the operating range and reduces electronic distortion.

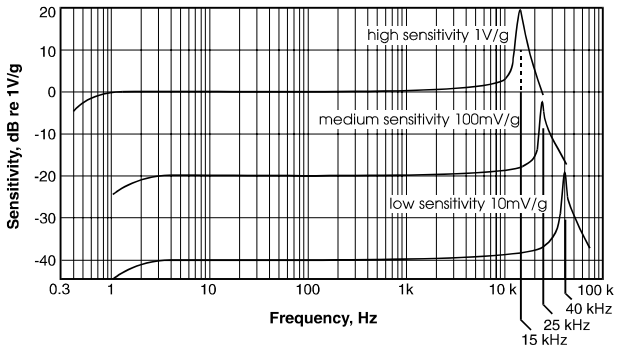

Figure 2. Typical Frequency Response Curves for Various Sensitivities

Most vibrations of industrial machinery contain frequencies below 1000 Hz (60,000 rpm), but signal components of interest often exist at higher frequencies. For example, if the running speed of a rotating shaft is known, the highest frequency of interest may be a harmonic of the product of the running speed and the number of bearings supporting the shaft. The user should determine the high frequency requirement of the application and choose a sensor with an adequate frequency range while also meeting sensitivity and amplitude range requirements. Note: Sensors with lower frequency ranges tend to have lower electronic noise floors. Lower noise floors increase the sensor's dynamic range and may be more important to the application than the high frequency measurements.

High amplitude vibration signals

The sensor operating environment must be evaluated to ensure that the sensor's signal range not only covers the vibration amplitude of interest, but also the highest vibration levels that are present at that measurement point. Exceeding the sensor's amplitude range can cause signal distortion throughout the entire operating frequency range of the sensor.

Temperature range

Sensors must be able to survive temperature extremes of the application environment. The sensitivity variation versus temperature must be acceptable to the measurement requirement. Temperature transients (hot air or oil splash) can cause metal case expansion resulting in erroneous output during low frequency measurements (<5Hz). A thermal isolating sleeve should be used to eliminate these errors.

Humidity

All vibration sensors are sealed to prevent the entry of high humidity and moisture. In addition, cable connectors and jackets are available to withstand high humidity or wet environments.

Hazardous environments: gas, dust, etc.

Vibration sensors certified as being Intrinsically Safe should be used in areas subjected to hazardous concentrations of flammable gas, vapor, mist, or combustible dust in suspension. Intrinsic Safety requirements for electrical equipment limit the electrical and thermal energy to levels that are insufficient to ignite an explosive atmosphere under normal or abnormal conditions. Even if the fuel-to-air mixture in a hazardous environment is in its most volatile concentration, Intrinsically Safe vibration sensors are incapable of causing ignition. This greatly reduces the risk of explosions in environments where vibration sensors are needed. Many industrial vibration sensors are now certified Intrinsically Safe by certifying agencies, such as Factory Mutual (FM), Canadian Standards Association (CSA), EECS, and CENELEC.

Electrical powering requirements

Most internally amplified vibration sensors require a constant current DC power source. Generally, the power supply contains an 18 to 30 Volt source with a 2 to 10 mA constant current diode (CCD) (see figure 3). When other powering schemes are used, consultation with the sensor manufacturer is recommended. A more thorough discussion of powering requirements follows.

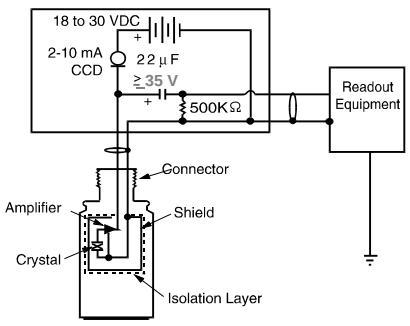

Figure 3. Powering Schematic

AC coupling and the DC bias voltage

The sensor output is an AC signal proportional to the vibration of the structure at the mounting point of the sensor. This AC signal is superimposed on a DC bias voltage (also referred to as bias output voltage or rest voltage). The DC component of the signal is blocked by a capacitor. This capacitor, however, passes the AC output signal to the monitor. Most monitors and sensor power supply units contain an internal blocking capacitor for AC coupling. If not included, a blocking capacitor must be field installed.

Amplitude range and the supply voltage

The sensor manufacturer usually sets the bias voltage halfway between the lower and upper cutoff voltages (typically 2V above ground and 2V below the minimum supply voltage). The difference between the bias and cutoff voltages determines the voltage swing available at the output of the sensor. The output voltage swing determines the peak vibration amplitude range (see figure 4). Thus, an accelerometer with a sensitivity of 100 mV/g and a peak output swing of 5 volts will have an amplitude range of 50 g peak.

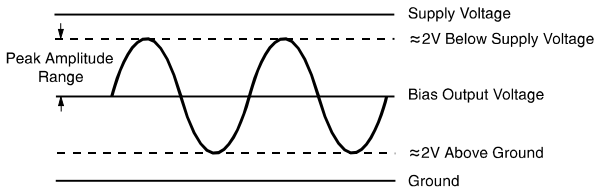

Figure 4. Range of Linear Operation

If a higher supply voltage is used (22 to 30 VDC), the amplitude range can be extended to 100 g peak. If a voltage source lower than 18 Volts is used, the amplitude range will be lowered accordingly. Custom bias voltages are available for lower or higher voltage supply applications.

Constant current diodes

Constant current diodes (CCD) are required for two-wire internally amplified sensors. In most cases, they are included in the companion power unit or monitor supplied. Generally, battery powered supplies contain a 2 mA CCD to ensure long battery life. Line powered supplies (where power consumption is not a concern) should contain a 6 to 10 mA CCD when driving long cables. For operation above 100ºC, where amplifier heat dissipation is a factor, limit the current to less than 6 mA.

If the power supply does not contain a CCD for sensors powering, one should be placed in series with the voltage output of the supply. It is important to ensure that proper diode polarity is observed. CCDs are available from Motorola and Siliconix (4 mA Part # 1N5312 and J510 respectively).

High temperature piezoelectric vibration sensors

High temperature industrial sensors are available for applications up to 1400ºF. Currently, high temperature sensors are not internally amplified above 170ºC (350ºF). Above this temperature, sensors are unamplified (charge mode). Charge mode sensors usually require a charge amplifier. The sensitivity of unamplified sensors should be chosen to match the amplitude range of the amplifier selected. The unit of sensitivity for charge mode accelerometers is expressed in picoCoulombs/g. It is necessary to use special low-noise, high temperature cables with charge mode sensors to avoid picking up triboelectric noise, erroneous signals caused by cable motion.

It is recommended that a custom thermal isolation mount be used with amplified sensors for applications where the frequency of interest is less than 5 kHz and the temperature is below 170ºC. Research is underway to extend the operating temperature of amplified transducers.

Triaxial sensors

Many industrial customers are using triaxial vibration sensors for multi-directional machine monitoring and balancing. These devices contain three mutually perpendicular sensors which give the user more information concerning machinery health than conventional single-axis units. Triaxial sensors are also easier to mount than three individual sensors.

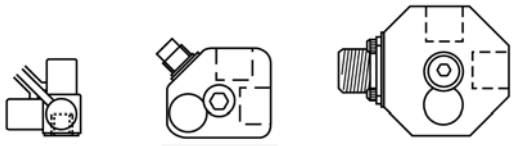

Figure 5. Triaxial Accelerometers

Handprobes

Handprobes are handheld vibration sensors used to measure vibrations. Requiring no mounting, they are quick, easy to use, and provide a good introduction to machine health monitoring. Though their frequency response is limited compared to stud mounted sensors, the information they provide can be very useful. Handprobes, used with portable dataloggers, are highly versatile instruments for vibration analysis and trend monitoring.

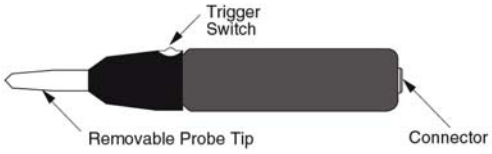

Figure 6. Model HA8 Handprobe

Summary

Vibration sensors are the initial source of machinery information upon which productivity, product quality and personnel safety decisions are based. It is crucial that sensors be properly selected and installed to ensure reliable signal information. This technical note outlined some of the critical parameters that must be considered when choosing industrial vibration sensors. Following this process will increase the effectiveness of your vibration monitoring program and improve productivity of plant personnel and equipment. The attached checklist may be used to aid in the process of senor selection.

Once industrial vibration sensors have been selected, they must be mounted on plant machinery. With a firm understanding of the sensor requirements, capabilities, and limitations, the vibration analyst should have evaluated and determined the mounting location of the individual sensors based upon the specific machine and vibration source to be monitored. Refer to Wilcoxon Research's technical note, "Mounting considerations for vibration sensors" for assistance with proper sensor mounting.

Sensor selection checklist

For assistance in selecting a vibration sensor, specific application and measurement requirements should be provided to the application engineer. Completing the checklist below will help ensure that the proper sensor is chosen.

I) Describe the vibration measurement application (check all that apply):

- ☐ Pulp and paper
- ☐ Petrochemical
- ☐ Power plant
- ☐ Oil exploration
- ☐ Mining
- ☐ Other _____
- ☐ Automotive
- ☐ Laboratory research
- ☐ Microelectronics
- ☐ Civil engineering
- ☐ Military

II) Please describe the dynamic measurement requirements of the application:

What is the approximate vibration amplitude level to be measured?
_____g peak, _____in/sec peak, _____mil peak
What is the maximum vibration amplitude level expected to be present?
_____g peak, _____in/sec peak, _____mil peak
What is the minimum vibration amplitude level of interest?
_____g peak, _____in/sec peak, _____mil peak
What is the maximum frequency of interest?
_____Hz, _____RPM
What is the minimum frequency of interest?
_____ Hz, _____RPM

III) Mechanical and chemical environment of the application:

What is the continuous temperature range? (min. to max.)
_____ to _____ ºC, _____ to _____ ºF
What is the intermittent temperature range? (min. to max.)
_____ to _____ ºC, _____ to _____ ºF
What is the expected humidity level? _____ % relative
What fluids contact the accelerometer? _____
If submerged, what fluid pressure will be present? _____ psi
What high amplitude mechanical signals present?
(i.e. steam valve release, gear chatter, impacts) _____
What is the highest shock level expected to be present? _____ g peak

MEGGiTT

What chemicals or gases contact the accelerometer or cable? (Check all that apply)

- ☐ Water (i.e. salt water, heavy water, steam) Describe:
- ☐ Halogens (i.e. chlorine, fluorine, halogenated compounds) Describe:
- ☐ Gases (i.e. ozone, chemical fumes) Describe:
- ☐ Acids (i.e. hydrochloric, sulfuric, nitric) Describe:
- ☐ Bases (i.e. ammonia, caustic soda) Describe:
- ☐ Solvents (i.e. MEK, Freon, Alcohol) Describe:
- ☐ Fuels (i.e. gasoline, kerosene) Describe:
- ☐ Oil (i.e. lubricating, crude) Describe:
- ☐ Other chemicals Describe:

IV) Electrical requirements and electrical environment of the sensor:

Is Intrinsically Safe operation required? (i.e. explosive environments) ____ yes (or) ____ no

What Power supply will be used? (18 - 30 Volt, 2 - 10 mA is usually recommended):
Manufacturer _____
Model # _____
Voltage Source _____
Constant Current Source _____(mA)

Is the machine grounded? ____ yes (or) ____ no
Is the sensor located near areas with electrostatic discharges? ____ yes (or) ____ no

Physical parameters and features of the sensor:

Sensor output:	__ Acceleration	__ Velocity	__ Displacement
Physical design:	__ Single axis	__ Triaxial	__ Ring shear mode
	__ Handprobe		
Special features:	__ Temperature output		__ Calibration circuit
	Other:_____		
Housing material:	__ 316 stainless steel		__ Titanium
	Other_____		

Desired characteristics:
Axial sensitivity _____mV/g
Frequency range to _____Hz
Resonance frequency _____kHz
Internal filtering requirements_____
Maximum weight _____grams
Size limitation: h _____ , l _____ , w _____

VI) Cabling requirements:

What cable lengths will be driven?
Cable length _____ft
Cable capacitance _____ pF/ft
Will the cable be near electromagnetic interference sources? (i.e. AC power lines, radio equipment, motors, and generators) ____ no (or) yes, describe:_____

Electrical connection:	__ Connector	__ Splash-proof	__ Integral cable
Electrical connection location:	__ Axial/top exit	__ Radial/side exit	
Cable type:	__ Coaxial	__ Two-conductor	__ Dual shielded
	Other_____		

Other cable requirements:_____

Reinforced cable:
Cable pull strength _____ lbs
Cable shielding _____ %
Other_____

VII) Mounting requirements (check request):

Mounting type:	__ Detachable stud	__ Integral stud	__ Captive bolt
	__ Adhesive	__ Magnetic base	
Thread size:	__ 10-32 UNF	__ 1/4-28 UNF	
	Other_____		

VIII) Other specific requests or requirements:

_____
_____
_____
_____

Reading accelerometer specifications

Wilcoxon Research accelerometer specification sheets follow a standard format. However, specification sheets may vary slightly from one specification to another. The following gives a basic description of each specification used on Wilcoxon Research accelerometer data sheets. These specification descriptions use the English units of measure. Wilcoxon specifications may also provide the metric equivalent.

Dynamic specifications

Sensitivity

This specification shows the “nominal” sensitivity. This is the voltage output per engineering unit; for example, 100 milli-Volts per g (100 mV/g) will yield an AC voltage output of 100 milli-Volts per g of acceleration. The AC voltage will alternate at frequencies corresponding to the vibrational frequencies. The amplitude of the AC signal will correspond to the amplitude of the vibration measured. All frequencies will be present simultaneously. This is what creates a vibrational signal spectrum.

Sensitivity tolerance

The tolerance of the sensitivity is the maximum allowable deviation between the nominal sensitivity for a model type and the actual measured sensitivity of a particular sensor, as measured at room temperature at 100 Hz.

The exact sensitivity of production accelerometers may vary from the nominal sensitivity within the specified tolerance range. The exact sensitivity of each unit is listed in the calibration data (test data) provided with each sensor. Internally amplified accelerometers are specified in “milli-Volts per g”. Internally amplified velocity sensors are specified in “milli-Volts per inch per second”. Non-internally amplified, charge mode type, sensors are specified in picoCoulombs per g, or “pC/g”.

Electronic noise

This is the electronic noise generated by the amplifier circuit. Noise is specified as either “broadband,” or “spectral.” The broadband measurement is a measurement of the total noise energy over a specified bandwidth (typically 2 - 25,000 Hz). Spectral noise is the

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noise measured at a specific frequency. This energy may be specified in equivalent units of vibration, “g”s.

Typically, the measured noise decreases as frequency increases. However, because lower acceleration readings are normally associated with lower frequencies, noise at low frequencies is more often a problem than noise at high frequencies.

Peak amplitude

Peak amplitude defines the maximum amplitude vibration that can be measured by a sensor before distortion occurs in the amplifier due to overloading. This can be estimated roughly as follows:

a) calculate the difference between the power supply voltage and the BOV
b) calculate the difference between the BOV and ground (0 V)
c) take the smaller of the value in (a) or (b) above and subtract 2 Volts.
d) take this value and divide it by the sensitivity (in Volts) of the sensor
e) the resulting number is a good approximation of the maximum amplitude signal (expressed in “g”s) that may be measured before distortion occurs.

Peak amplitude is a function of the sensitivity of the sensor, the power supply voltage and the BOV of the sensor. This is the same for all 2-wire IEPE type sensors.

The laws of physics are the limit here, and apply equally to all sensor manufacturers. If the maximum amplitude of a given sensor is not sufficient for the application, the solution is to use a sensor with a lower sensitivity, or in some cases it may be possible to use a sensor with a higher BOV and power supply voltage.

Frequency response

The frequency response specification shows the maximum deviation of sensitivity over a frequency range. Remember, the nominal and actual sensitivity for a sensor are measured at a specific frequency; normally 100 Hz for most industrial sensors.

The frequency response specification shows a range at +/- a percentage (example, +/- 5%, or +/- 10%), or it may show a range for +/- 3 dB. The +/-

percentage means that over the specified frequency range the sensitivity will be within the percentage stated. The 3 dB range is generally used in military or scientific specifications, 3 dB is approximately 30%. So +/- 3 dB is approximately +/– 30 %.

The frequency response of a sensor is typically governed at the high frequency end primarily by the mechanical resonance of the sensor. Low-end frequency response limitations are the result of low frequency “highpass” filtering used by all manufacturers to reduce the amplifier noise at low frequencies generally caused by thermal events.

In some cases, primarily low frequency sensors, there may also be high frequency “low-pass” filters used to eliminate unwanted signals and interference from high frequency vibration signals.

Resonance frequency

This is the primary (largest) mechanical resonance of the sensor. However, there may be sub-resonances present at lower frequencies.

Temperature output sensitivity

This is the voltage output change per degree of measured temperature. The temperature circuit is separate from the accelerometer circuit. The temperature circuit is powered by the same type of power supply as an internally amplified accelerometer. The temperature circuit “biases” this power supply voltage down to a voltage that corresponds to the accelerometer case temperature.

Some older models (793T-1) provide an output in volts per degree Celsius. This limits the usable range to a low temperature of 0° C. Newer models provide an output corresponding to degrees Kelvin (K). Zero degrees Kelvin equals a zero Volt output. Zero degrees Kelvin equals –273°C.

Temperature output range

The temperature output range for units measuring in Kelvin is –50°C to 120°C. The limiting factor is the operating range of the accelerometer.

Electrical specifications

Power, voltage

The maximum and minimum input power voltage that should be supplied to the sensor is important to the user. Over voltage powering may damage the sensor. Under voltage powering may result in poor amplifier performance and signal distortion due to overloading the amplifier with vibration signals that exceed the maximum peak amplitude as discussed above.

Power, constant current

The input power current must be regulated to protect the amplifier from damage. This current regulation is normally done by a constant current diode (CCD) in the data collector or analyzer power supply. Bias Output Voltage (BOV) is set by the amplifier circuit “biasing” the input power voltage down to a preset level. The normal range for BOV of a good sensor is typically the nominal value specified on the data sheet, +/- 2 Volts.

Turn-on time

The time required by a sensor to reach 90% of its final BOV after initial powering is provided because it is important for walk around data collection or other applications in which the sensors are not powered until the time when data is to be taken.

Shielding

Sensors are either base isolate, case isolated, or case grounded. A case isolated sensor has the signal return and ground circuit isolated from the external case of the sensor. A case grounded sensor has the signal return and ground circuit electrically connected to the external case of the sensor. A base isolated sensor is not grounded at the sensor’s mounting location, but the body of the sensor is usually grounded to the connector’s shield. A Faraday shield is used to shield the amplifier circuit from electro-magnetic interference. Practically all Wilcoxon Research sensors (except for some special laboratory models) have protection against mis-wiring and electrostatic discharge (ESD).

Mechanical specifications

Temperature range

This is the temperature range over which the sensor is designed to operate. It is also the maximum and minimum storage temperatures. Permanent damage may result from exposure to temperatures outside of those specified. Normally, exposures to temperatures outside of the specified range for brief periods of time will not result in damage to the sensor.

Weight

The weight of sensor is given excluding any external cabling.

Sensing element material

All Wilcoxon Research sensing elements are PZT ceramic, Lead-Zirconate Titanate, but this is listed in the specifications to differentiate from other manufacturers who may use different materials.

Sensing element design

The sensor design – shear, compression, or flexure – is distinguished on many specifications.

Sealing

Sealing is either hermetic or epoxy. The I.P. rating is provided in some cases.

Case material

Most industrial housings are corrosion resistant, non-magnetic, 316L stainless steel.

Mounting

Stud, captive bolt, or epoxy are the most common sensor mounts for Wilcoxon accelerometers.

Other information on data sheets

In addition to the above items, Wilcoxon Research data sheets also include typical curves showing frequency response and temperature response.

The list of “accessories supplied” are items that are furnished with the accelerometer as standard practice at no extra charge. The “optional accessories” are items that are available for an additional charge.

The revision level is shown in the lower right hand corner of each data sheet. It is important to check this to make sure that you are working with the latest information.

Industrial vibration sensor selection: Piezovelocity transducers

In many industrial monitoring applications, piezovelocity transducers have distinct advantages over piezoelectric accelerometers and traditional velocity pickups. Integration to velocity within the sensor overcomes low frequency cable pickup and the input noise of data acquisition equipment. In addition, the inherent high frequency attenuation of the velocity output greatly reduces overload distortion.

Introduction to piezovelocity transducers

Today, a vast majority of machinery vibration information is recorded and quantified in terms of velocity. Most vibration measurements in the process industries are analyzed in terms of inches per second (ips) in the United States, or mm/sec on the SI systems. Velocity readings are generally recommended for measurements in the 100 to 30,000 CPM (1.7 to 500 Hz) frequency band.

Accurate and reliable vibration sensors are critical for successful machinery monitoring programs. PiezoVelocity Transducers (PVT) out-perform general purpose accelerometers and electrodynamic velocity pickups on slow speed equipment. In the 90 to 3600 CPM range, PVT internal integration provides greater signal fidelity than standard accelerometers. Solid state PVTs are more reliable and measure broader frequencies than electrodynamic pickups. For many permanent sensor installations in paper mills, steel, and power generation facilities, a PVT sensor is the best investment.

The PVT is essentially a piezoelectric accelerometer with an on-board velocity converter. The transducer employs a piezoceramic sensing element and dense seismic mass to produce a charge output proportional to acceleration. The high impedance charge signal is converted within the sensors to a low impedance voltage output and integrated to velocity. Section views of compression and shear mode PVTs are shown in figures 1a and 1b; the integration amplifier circuit diagram is shown in figure 2.

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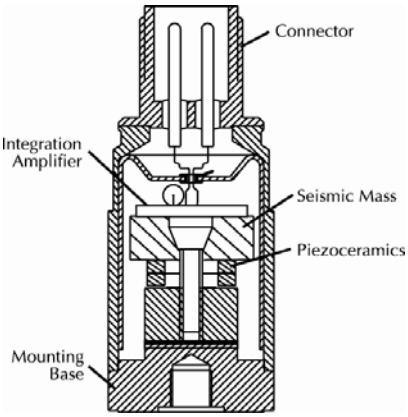

Figure 1a: Compression mode piezovelocity transducer

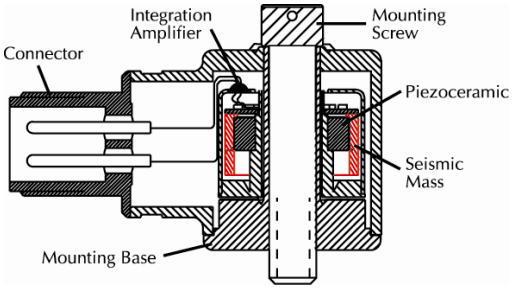

Figure 1b: Shear mode piezovelocity transducer

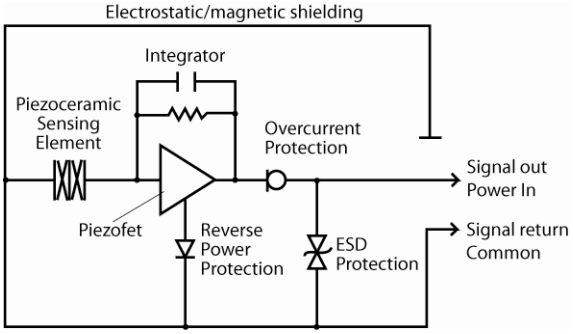

Figure 2: Circuit diagram for a piezovelocity transducer

Limitations of electrodynamic pickups

In contrast to piezoelectric devices, electrodynamic pickups are used above the natural frequency of the transducer. Electrodynamic velocity pickups generate a very powerful output signal, but introduce phase errors at low frequency and are susceptible to electromagnetic fields. They also contain moving parts and are subject to wear or possible failure. Although modern designs minimize traditional deficiencies, solid-state piezoelectric devices are far more advanced.

The electrodynamic frequency response is very limited compared to PVTs. The typical 600 CPM (10 Hz) low-end cutoff frequency is above the running speed of many paper machines and other industrial equipment. Conversely, typical PVTs cutoff at 90 CPM (1.5 Hz). Comparison response characteristics are given below (figures 3a and 3b).

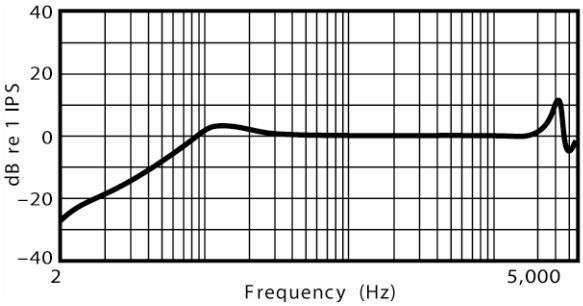

Figure 3a: Electrodynamic velocity pick-up

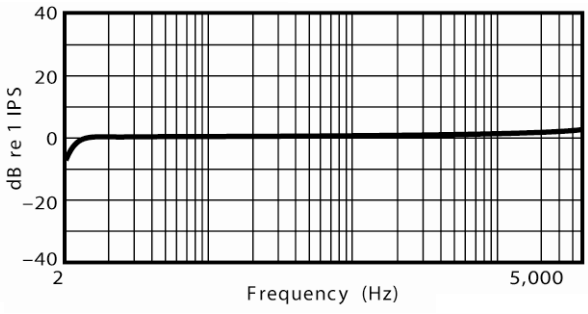

Figure 3b: PiezoVelocity transducer response

Many bearing and gear defects exhibit fault frequencies far above the range of electrodynamic pickups. High frequency usage of electrodynamic picups is limited by the contact resonance of the mount. Depending on the sensor housing and mounting surface stiffness, the contact resonance varies between 120,000 and 180,000 CPM (2000 to 3000Hz). The calibrated bandwidth is usually limited to 60,000 CPM (1000 Hz). In contrast, piezoceramic PVTs measure well beyond 300,000 CPM (5000 Hz).

Piezoelectric accelerometers

Industrial accelerometers consist of a piezoceramic material sandwiched between a seismic mass and the structure base. The seismic mass and piezoceramic create a simple mass/spring system with a very high natural frequency. Accelerometers and PVTs use Tungsten masses and Lead-Zirconate Titanate piezoceramic to maximize sensitivity at low frequencies.

In the region below resonance, the mass applies a force to the piezoceramic material proportional to the vibratory acceleration of the structure. The piezoceramic, in response to the applied force, generates a proportional electric charge on its surface; the charge output is then available as a signal that is fed to the measurement circuit.

Accelerometers are extremely versatile and widely used for industrial machinery monitoring. Typical industrial accelerometers measure micro-g vibration levels from below 60 CPM to greater the 900,000 CPM (1 to 15,000 Hz). However, the PVT provides a stronger output on slow to moderate speed machinery.

In low frequency applications, standard 100 mV/g accelerometers are limited by electronic amplifier and noise. Over the frequency range of 90 to 3600 CPM (1.5

to 60 Hz), the PVT has a significantly greater signal-to-noise ratio than a typical accelerometer. In most cases, PVTs can directly replace the piezoelectric accelerometer, even accepting the same mounting, connectors, cabling, powering and monitoring equipment.

Below 90 CPM, PVTs are limited by the cutoff frequency of the integration circuit. Relative to acceleration, the output of the PVT increases with decreasing frequency. The low frequency cutoff is required to limit gain and keep the amplifier in its linear range. On very slow speed equipment, 500 mV/g low frequency accelerometers are generally used.

PVT low frequency amplification

In many slow speed applications, an accelerometer is externally integrated to velocity inside the data collecting monitor. Along with vibration information, the integration circuit amplifies low frequency electronic noise from the sensor and the monitor. Figure 4 shows noise plots for a 100 mV/g general purpose accelerometer and a 100 mV/g PVT. The externally integrated electronic noise from the accelerometer is considerably higher than the PVT. This integration noise produces a response commonly referred to as “ski slope”.

In terms of acceleration, low frequency vibration energy in rotating machinery is generally very low in amplitude. The increased low frequency sensitivity of a PVT can dramatically improve data integrity by amplifying the vibration signal before it reaches the monitor. A low frequency 500 mV/g accelerometer may exhibit a lower noise floor compared to an equivalent PVT, however, in the 90 to 720 CPM bandwidth, the PVT has a higher output voltage.

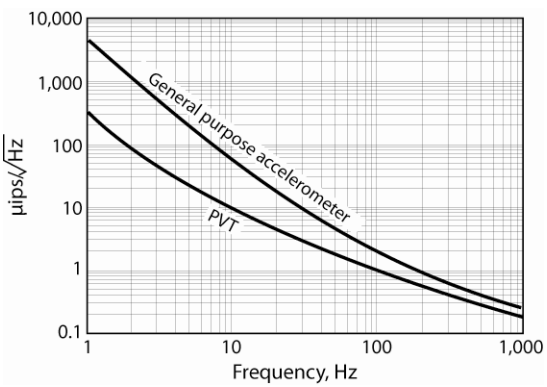

Figure 6: Noise response comparison between a 100 mV/g general purpose accelerometer and a 100 mV/g PVT, normalized in terms of velocity.

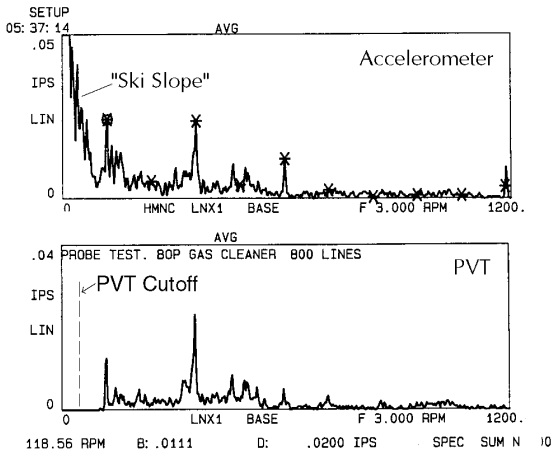

Figure 7: Spectral plot comparison between an accelerometer and a PVT.

The spectral plots in Figure 7 contrast the outputs of a PVT and an accelerometer. These readings, taken on a cooling tower fan, show “ski slope” integration noise affecting the accelerometer measurement. The fan running speed is 118.56 CPM.

High frequency mechanical noise attenuation

In some applications, very high amplitude signals are present far above the frequencies of interest. Accelerometers are inherently sensitive to high frequency vibrations. Mechanical noise from machine structures can excite high frequencies and overload the internal amplifier. Amplifier overload will produce intermodulation distortion and severely interfere with low frequency measurements. High frequency noise sources include worn steam seals, air leaks, pump cavitation, and impacts from reciprocating machinery. Intemodulation distortion due to nondiscreet noise (i.e. steam “hiss”) is sometimes called “washover” distortion.

When an external integrator converts the acceleration signal to velocity, distortion products are amplified along with the low frequency vibration data. These distortion products sometimes appear as a magnified “ski slope” and can easily mask real vibration data. False signals can exceed alarm conditions and trigger shutdown of healthy machinery. Internal integration attenuates these signals before they can corrupt and obscure low frequency data.

High frequency electromagnetic noise

High frequency electromagnetic noise can also interfere with a low frequency measurement. Accelerometer cables, installation routes, and termination enclosures may introduce false signals if they are not protected from electromagnetic radiation and transient sources. Electromagnetic noise sources include radio transmission, radar equipment, and electrostatic discharge.

Accelerometer amplifiers can operate as AM radio detectors and convert radio signals to audio frequencies. Cables, depending upon length and location, will act as antennae and receive the radio transmissions. Once received, the amplifier can rectify the interference and insert low frequency signals into the band of interest. The low frequency amplification and high frequency filtering of the PVT eliminate these problems.

PVT machinery health monitoring applications

Measurement errors caused by low frequency distortion are particularly acute in industrial applications such as paper machine monitoring. In these applications, low amplitude, low frequency signals are monitored in an environment surrounded by competing vibration sources and electromagnetic interference. PVTs are less susceptible to high frequency sources, electrical or mechanical, and therefore eliminate many errors. In addition, velocity amplification inside of the sensor reduces the relative amplitude of any signals picked up by the cable before they enter the receiving system. Distortion products that may occur are small in comparison with the desired velocity signal.

Paper machine roller bearings

PVTs have distinct advantages in paper machine applications where low frequency noise reduction is a primary objective. Paper machine running speed faults are typically measured in the 100 to 1200 CPM band. PVTs prevent external integration noise from hiding looseness, misalignment and imbalance information. They also attenuate noise from steam seal leaks and electrostatic discharge.

In the bearing fault frequency bands below 120,000 CPM, PVTs compete with general purpose accelerometers and are far superior to electrodynamic pickups. Mount the PVT radially at the load zone of the bearing for greater sensitivity to high order fault harmonics.

PVTs are not recommended for use with HFD type measurements. Although the PVT will detect high frequency impact noise, accelerometers will provide earlier warning of bearing faults. Very slow speed rollers turning less than 100 CPM, should be monitored with 500 mV/g low frequency accelerometers, not with PVTs.

Cooling towers

PVTs perform well in cooling tower applications. Many cooling tower fans operate in the 100 to 700 CPM region. The PVT provides strong velocity data on fan speed, blade pass, looseness, and alignment. Mount the PVT horizontally on the pinion of the gear box to increase sensitivity to gear mesh harmonics.

If fan speeds are less than 100 CPM, 500 mV/g low frequency accelerometers should be used, not PVTs. 100 mV/g accelerometers are generally used to monitor the motor end of the cooling tower.

Vertical pumps

Vertical pumps typically operate between 300 and 1800 CPM. PVTs provide earlier detection of imbalance and blade pass problems than standard accelerometers. The PVT eliminates mechanical overload from high frequency cavitation noise.

If monitoring HFD for incipient bearing faults or cavitation problems, 100 mV/g accelerometers are preferred to PVTs. Use proximity probes to monitor relative movement of the pump shaft.

Conclusions

Piezoelectric velocity sensors exhibit many advantages over traditional electromagnetic pickups and accelerometers for many industrial machinery applications.

PVTs are available in a variety of packages, including triaxial, handprobe, and bolt through configurations. The sensitivity and frequency response can be factory adjusted to customer specification. Amplifiers include such features as miswiring and electrostatic discharge protection circuitry. Intrinsically safe models with Factory Mutual, CSA, and EECS certification are also available.

Reference

Guy, Kevin R. “Monitoring and Analysis with Electronic Data Collectors”, Mini Course A, Mini Course Notes: 16th Vibration Institute National Meeting, 1992.

Wowk, Victor,”Machinery Vibration: Measurements and Analysis”, McGraw Hill Inc, 1991, pp.66-69.

Judd, John & Ramboz, John, “Special-Purpose Transducers”, *Shock and Vibration Handbook*, 3rd ed., Cyril M. Harris, Ed., McGraw Hill Inc, 1988., pp. 14-1 to 14-5.

Computational System Incorporated, “Selection of Proper Sensors for Low Frequency Vibration Measurements”, *Noise & Vibration Control Worldwide*, October 1988, p.256.

Schloss, Fred, “Accelerometer Overload”, *Sound and Vibration*, January 1989, p.12.

Device parameters for Wilcoxon's intrinsically safe certified sensors

An intrinsically safe system is composed of an intrinsically safe apparatus, an associated apparatus, and interconnecting cables. In the case of vibration sensors, the intrinsically safe apparatus is the sensor itself. The associated apparatus is the safety barrier.

When the sensor is approved as intrinsically safe for use in hazardous areas, there are certain limitations placed upon it. The sensor cannot be connected to "any old" safety barrier. Rather, the barrier must have intrinsically safe ratings that are compatible with those of the sensor. Apparatuses have five rating parameters: Voltage, Current, Power, Capacitance, and Inductance.

The open-circuit voltage available at the terminals of the barrier is V_{oc}, or V_t. The short-circuit current available at the terminals of the barrier is I_{sc}, or I_t. The maximum capacitance that can be connected to the barrier apparatus is C_a while the maximum inductance that can be connected is L_a. The vibration sensor voltage rating, V_{max} or U_i, is the maximum voltage that can be applied to the terminals of the sensor. The current rating, I_{max} or I_i, is the maximum current that can be applied through the terminals of the sensor. The value of internal capacitance, C_i, and inductance, L_i, are also stated. When the sensor and barrier are connected together, the cable capacitance, C_{cable}, and inductance, L_{cable}, must be considered a part of the system. More recent approvals also factor in the total power applicable to the sensor, P_i, and the maximum power output, P_o, available from a barrier.

By comparing the rating of the vibration sensor with that of the barrier and taking the cable values and power into account, an appropriate safety barrier can be selected. As long as the ratings satisfy the following equations, the system will meet the requirement for an intrinsically safe system.

V_{oc} (or V_t) must be equal to or less than V_{max} (or U_i)
I_{sc} (or I_t) must be equal to or less than I_{max} (or I_i)
C_a must be greater than or equal to $C_i + C_{cable}$
L_a must be greater than or equal to $L_i + L_{cable}$
P_i must be greater than or equal to P_o

$$V_{oc} \leq V_{max}$$
$$I_{sc} \leq I_{max}$$
$$C_a \geq C_i + C_{cable}$$
$$L_a \geq L_i + L_{cable}$$
$$P_i \geq P_o$$

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Wilcoxon intrinsically safe apparatus parameters

Sensors with certificate type FM are approved in the US.
Sensors with certificate type CSA are approved in Canada.
Sensors with certificate type ATEX are approved in EU countries.

	Device Parameters					Certificate	
Model	**Gp A,B:Vmax**	**Vmax**	**Imax**	**Ci**	**Li**	**type**	**Certification**
766E	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	FM	CL I, II, III, T4, Div 1 Group A B C D E F G Div 2 Group A B C D F G
793E	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	FM	CL I, II, III, T4, Div 1 Group A B C D E F G Div 2 Group A B C D F G
793LE	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	FM	CL I, II, III, T4, Div 1 Group A B C D E F G Div 2 Group A B C D F G
793VE	30 Volts	30 Volts	180 mA	0.32 µF	0.0 mH	FM	CL I, II, III, T4, Div 1 Group A B C D E F G Div 2 Group A B C D F G
793V-5E	30 Volts	30 Volts	180 mA	0.32 µF	0.0 mH	FM	CL I, II, III, T4, Div 1 Group A B C D E F G Div 2 Group A B C D F G
797E	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	FM	CL I, II, III, T4, Div 1 Group A B C D E F G Div 2 Group A B C D F G
797LE	30 Volts	30 Volts	180 mA	0.03 µF	0.0 mH	FM	CL I, II, III, T4, Div 1 Group A B C D E F G Div 2 Group A B C D F G
797VE	30 Volts	30 Volts	180 mA	0.32 µF	0.0 mH	FM	CL I, II, III, T4, Div 1 Group A B C D E F G Div 2 Group A B C D F G
376E/CC726E	26.6 Volts	30 Volts	180 mA	0.14 µF	0.0 mH	FM	CL I, II, III, T4, Div 1 Group A B C D E F G Div 2 Group A B C D F G
Model	**Ui**	**Imax**	**Pmax**	**Ci**	**Li**	**Certificate**	**Certification**
766-33	28 Volts	93 mA				CSA	Ex ia CL I, Div 1 Groups A B C D
786A-IS	28 Volts	93 mA	600 mW	0.10 µF	0.0 mH	CSA/ATEX	CL I Div 1;Groups A,B,C,D, CL II Div 1 Groups E,F,G CL III Div1 / Ex ia IIC T4
786F-IS	28 Volts	93 mA	600 mW	0.11 µF	0.0 mH	CSA/ATEX	CL I Div 1;Groups A,B,C,D, CL II Div 1 Groups E,F,G CL III Div1 / Ex ia IIC T4
786T-IS	28 Volts	93 mA	600 mW	0.13 µF	0.0 mH	CSA/ATEX	CL I Div 1;Groups A,B,C,D, CL II Div 1 Groups E,F,G CL III Div1 / Ex ia IIC T4
787A-IS	28 Volts	93 mA	600 mW	0.10 µF	0.0 mH	CSA/ATEX	CL I Div 1;Groups A,B,C,D, CL II Div 1 Groups E,F,G CL III Div1 / Ex ia IIC T4
787A-M8-IS	28 Volts	93 mA	600 mW	0.10 µF	0.0 mH	CSA/ATEX	CL I Div 1;Groups A,B,C,D, CL II Div 1 Groups E,F,G CL III Div1 / Ex ia IIC T4
793-33	28 Volts	93 mA				CSA	Ex ia CL I, Div 1 Groups A B C D
793L-33	28 Volts	93 mA				CSA	Ex ia CL I, Div 1 Groups A B C D
793V-33	28 Volts	93 mA				CSA	Ex ia CL I, Div 1 Groups A B C D
793V-5-33	28 Volts	93 mA				CSA	Ex ia CL I, Div 1 Groups A B C D
797-33	28 Volts	93 mA				CSA	Ex ia CL I, Div 1 Groups A B C D
797L-33	28 Volts	93 mA				CSA	Ex ia CL I, Div 1 Groups A B C D
PC420-EX	Explosion Proof model - Device parameters do not apply						Cl.I, Div.1,2,Grp A,B,C,D
PC420-IS	30 Volt	106 mA		0.006	0.0 mH	CSA	Cl.I, Div.1, Grp A,B,C,D
PC420-IS	30 Volt	106 mA		0.006	0.0 mH	CSA	Cl.I, Div.1, Grp A,B,C,D
PC420-IS	30 Volt	106 mA		0.006	0.0 mH	CSA	Cl.I, Div.1, Grp A,B,C,D
Model	**Ui**	**Ii**	**Pi**	**Ci**	**Li**	**Certificate**	**Certification**
766-35	28 Volts	93 mA	600 mW	0.03 µF	0.0 mH	ATEX	Ex ia IIC T4
793-10-35	28 Volts	93 mA	600 mW	0.05 µF	0.0 mH	ATEX	Ex ia IIC T4
793-35	28 Volts	93 mA	600 mW	0.03 µF	0.0 mH	ATEX	Ex ia IIC T4
793V-35	28 Volts	93 mA	600 mW	0.72 µF	0.0 mH	ATEX	Ex ia IIA T4
797-35	28 Volts	93 mA	600 mW	0.03 µF	0.0 mH	ATEX	Ex ia IIC T4
797-5-35	28 Volts	93 mA	600 mW	0.03 µF	0.0 mH	ATEX	Ex ia IIC T4
797L-35	28 Volts	93mA	600 mW	0.05 µF	0.0 mH	ATEX	Ex ia IIC T4
PC420-EX	Explosion Proof model - Device parameters do not					ATEX	EEX d IIC T3
PC420-IS	30 Volt	106 mA	750 mW	0.000	0.0 mH	ATEX	EEx ia IIC T3
PC420-IS	30 Volt	106 mA	750 mW	0.000	0.0 mH	ATEX	EEx ia IIC T3
PC420-IS	30 Volt	106 mA	750 mW	0.000	0.0 mH	ATEX	EEx ia IIC T3

Compatible barrier devices

Generally, the MTL 7728+ or 728+ zener barrier, or equivalent, will be the proper choice for all 700-series and 376 type dynamic sensors. The Wilcoxon LPS Series of 4-20 mA sensors can be used with the MTL 7787 or 787 zener barrier, or equivalent.

Device specifications are subject to change, due to the research nature of the organization and our commitment to continuous improvement. Please contact a Wilcoxon customer sales and service representative to ensure accuracy.

Wilcoxon Research

4-20 mA LPS™ Series transducer selection guide

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Table of contents

Introduction

With the availability of 4-20 mA vibration transducers, plant personnel can now input vibration information directly to their Programmable Logic Controller (PLC) or Distributed Control System (DCS). This capability allows plant personnel to trend overall vibration data on their machines and correlate vibration data to plant operating conditions, and allows plant operators to schedule maintenance tasks on machinery.

A trained vibration analysis technician has, traditionally, been the person to evaluate the mechanical condition of machinery in a Condition Based Maintenance (CBM) program. Now, transducers that can provide plant personnel with an indication of the overall vibration levels can help guide a CBM program even when there is no vibration technician available to determine machinery condition.

Wilcoxon's loop powered sensors (LPS™) are self-contained 4-20 mA vibration transmitters. LPS™ transducers can directly input a 4-20 mA signal to a plant's control system and make the vibration condition of machines available to operating personnel. Machinery critical to the operation of the plant can be monitored continuously. This data can then be used to aid and assist the operating personnel in determining when to perform maintenance, as well as direct them to machines with the most severe vibration problems.

This selection guide will help in choosing the proper range and type of transducer.

It is not the purpose of this document to provide detailed instructions for analyzing machinery vibration problems. There are many other useful publications that can aid in diagnosing vibration problems. Links to such useful information can be obtained from the Wilcoxon web site at www.wilcoxon.com or by calling Wilcoxon at 301-330-8811.

Predictive maintenance and vibration monitoring

Using predictive maintenance (PdM) technologies to track machine health is a proven industry best practice. Vibration monitoring is a critical part of any effective PdM strategy. Monitoring plant machinery health reduces outages and downtime, and Wilcoxon's customers save money.

Using vibration monitoring, PdM can detect:

- Shaft misalignment
- Rotor imbalance
- Gear failure, and
- Bearing faults

Wilcoxon supplies an extensive line of vibration monitoring sensors and monitoring instruments that provide a multitude of machinery condition information. Wilcoxon's 4-20 mA series of loop powered sensors makes machine health monitoring a convenient, reliable and cost-effective option for a wide array of plant assets. The LPS™ Series of sensors outputs a signal between 4 mA and 20 mA that correlates directly to the average vibration of the machine being monitored. This provides a simple means to trend the relative level of vibration and drive your maintenance strategy only as needed for a cost effective operation and prevent machine failures before they occur.

Wilcoxon's LPS™ Series transducers are available with a host of features to meet every application:

- Configured with peak, true peak or RMS output signals, representing either velocity or acceleration.
- Dual output of temperature and 4-20 mA vibration signal provide critical data for temperature-sensitive operations.
- Dual output of dynamic and 4-20 mA vibration signal units provide an effective way to trend vibration data (4-20 mA signal) and still have access to the dynamic vibration signal for more extensive analysis.
- For those really harsh environments, many units are available with intrinsically safe operation or with explosion proof cases.

Selection considerations

Velocity is the primary measurement of machinery vibration. While there are some applications that require displacement limits, velocity is most often used for vibration measurements on the external case of machines. Since Wilcoxon's LPS™ Series transducers are mounted on the external case of machines, velocity would be the best measure to use for condition assessment. The LPS™

Series is available in units that measure vibration in terms of velocity or acceleration for condition assessment.

LPS™ Series transducers are purchased with a specific full-scale setting. The full-scale is not adjustable by the user. Condition evaluation and the ISO 10816 standard for vibration measurement should be used to determine the best full-scale range for a particular monitoring environment.

Full scale selection guidelines

- What is the normal overall vibration level of the machine?

When the normal vibration level of a machine is used to guide selection, the transducer will be able to give a reliable reading with enough resolution to determine minor variations from normal vibration levels. The normal level of vibration should fall within 10% to 20% of the full-scale range of the transducer. For example, a machine that has a normal overall vibration velocity of 0.15 inches per second (ips), peak, might be monitored best with a transducer having a full-scale range of 1.0 ips peak.

- What is the limit for unacceptable vibration?

Manufacturer specified limits for the machine's vibration should be used as a guide to selecting the proper range for a LPS™ Series transducer. When the manufacturer has not specified limits, the ISO standard can be used as a guide. For example, the ISO standard indicates that a 200 HP (150 kW) motor with a rigid rotor would have an unacceptable vibration at 0.25 in/sec (peak) which is 4.5 mm/sec (RMS).

- Is over-range capability for trending desired?

The standard ranges available in the LPS™ Series will allow for some over-range capability, but some users may wish to have more. Consider the example of a 50 HP motor driving a fan with a history of cracks. When cracked, the fan may exhibit vibration of 1 to 2 IPS. Here it may be desirable to use a transducer with a full-scale range of 2.0 IPS to accommodate measuring the fan imbalance when cracked blades occur.

ISO 10816 guidance

Assistance in determining rotating machinery condition is now available within the ISO 10816 Standard, "Mechanical vibration – Evaluation of machine vibration by measurements on non-rotating parts." The portion of the ISO 10816 that is most useful for helping to determine vibration limits and, hence transducer selection, is part 3, "Industrial machines with nominal power above 15 kW and nominal speeds between 120 revolutions per minute and 15,000 revolutions per minute when measured in situ."

Machines are classified into groups according to machine type, rated power or shaft height. Additionally, the group vibration zones are separated according to whether the machines operate above or below 80% of the first shaft critical speed. Machines that have their main excitation frequency (usually running speed) below 80% of the first critical speed in the direction of measurement are considered to be operating in the rigid rotor mode. Machines with their main excitation frequency above 80% are considered to be operating in the flexible rotor mode.

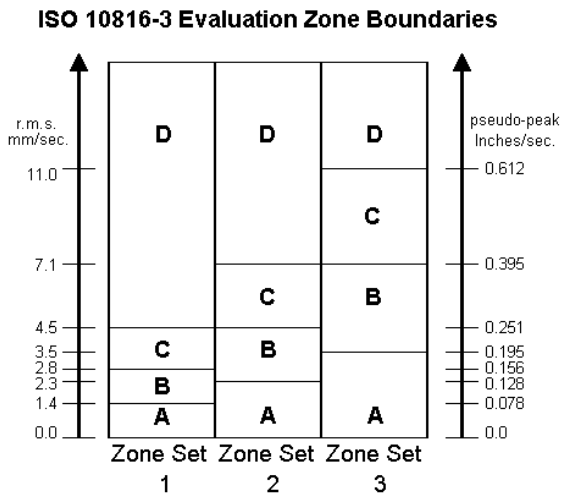
Equipment groups

- Group 1: Large machines with rated power above 300 kW (~400 HP); electrical machines with a shaft height at or above 315 mm (12.4"). These machines normally have sleeve (journal) bearings.
- Group 2: Medium-size machines with a rated power above 15 kW (~20 HP) up to and including 300 kW (~400 HP); electrical machines with a shaft height between 160 mm and 315 mm (6.3" to 12.4"). These machines usually have rolling element bearings and run at speeds above 600 revolutions per minute.
- Group 3: Pumps with multivane impeller and with separate driver (centrifugal, mixed flow, or axial flow) with rated power above 15 kW.
- Group 4: Pumps with multivane impeller and with integrated driver (centrifugal, mixed flow, or axial flow) with rated power above 15 kW.

Evaluation zones

The following evaluation zones are defined to permit a qualitative assessment of the vibration of a given machine and provide guidelines on possible actions.

Zone A: The vibration of newly commissioned machines would normally fall within this zone.
Zone B: Machines with vibration within this zone are normally considered acceptable for unrestricted long-term operation.
Zone C: 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: Vibration values within this zone may be of sufficient severity to cause damage to the machine.



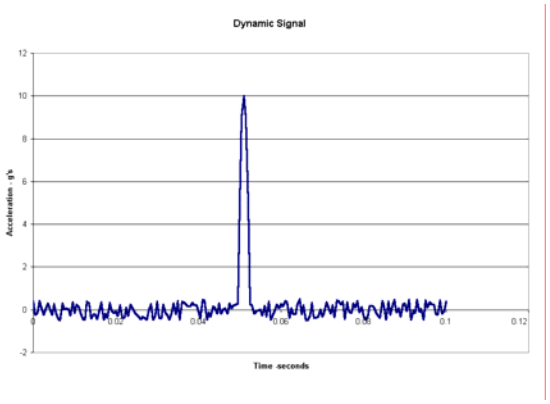
The ISO 10816-3 recommended evaluation zone boundaries for the various groups of equipment, referring to the table of Zone Set boundaries, are as follows:

Equipment	Rotor mode: rigid	Rotor mode: flexible
Group 1 machines over 300 kW	Zone set 2	Zone set 3
Group 2 machines between 15 and 300 kW	Zone set 1	Zone set 2
Group 3 pumps, separate driver, >30 kW	Zone set 2	Zone set 3
Group 4 pumps, integrated driver, >30 kW	Zone set 1	Zone set 2

Output types available with Wilcoxon 4-20 mA transducers

All Wilcoxon broadband LPS™ Series transducers are available with output calibration in terms of peak, RMS or true peak. The frequency banded versions only offer peak or RMS output calibration.

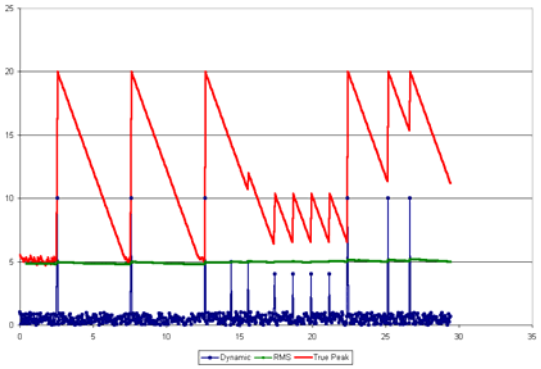
In the figure to the right there is a simulated pulse of 10g amplitude and 2.5 millisecond duration. This kind of pulse will not produce a significant change in the output of the traditional Root-Mean-Square (RMS) output transmitter. The RMS energy in such a short duration pulse is not significant enough to produce much change in the output loop current.



The chart to the left shows the difference between the response of an RMS transmitter, a peak transmitter, and the Wilcoxon true peak transmitter. The RMS and peak outputs change very little as a result of the transient acceleration pulse. However, the true peak signal actually "captures" the pulse level accurately

Capturing the peak is only one part of the function of true peak detection. If the transmitter were to simply track the true peak, the output would be changing rapidly all during the sampling process of the PLC/DCS system. Most PLC/DCS systems will sample input just once per second. So how can the system know when a transient signal has occurred?

The Wilcoxon true peak detector will capture the peak then ramp back to the ambient vibration peak level at 20% of full scale per second. The chart to the right illustrates that the output current went up to 20 mA at the occurrence of the peak.



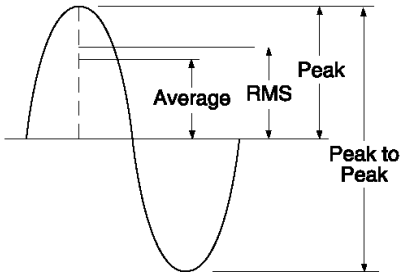
It then ramped back down over a time period of almost 5 seconds. During this "ramp down" the PLC/DCS has multiple opportunities to sample the signal and record the transient event.

So how do these peak detecting transmitters handle multiple transient signals such as loose components or parts? The chart here illustrates the relative output differences between the RMS and true peak transmitters.

As more and more transient pulses are detected, the true peak output tends to "remain" at a high level. As long as the incoming new pulse exceeds the current value being output from the transmitter, the output will rise to the new level before ramping down.

This capability allows using the true peak detection units for detecting the beginning of impacting events resulting from loose components. It is also useful for monitoring other transient events that produce high acceleration "spikes" during operation. Pump cavitation often produces a sound characterized as "pumping rocks" when cavitation occurs. The "water hammer" of piping systems can also be monitored since the peak detection unit is sensitive enough to capture those events as well.

Vibration transmitters generally compute the RMS value of the vibration signal. "Peak" output transmitters simply use the convention of multiplying by the ratio of the RMS to peak in order to calibrate their output. This results in a "pseudo-peak" output in that it is a peak value if the entire energy of the vibration were a single sinusoidal signal. In a traditional transmitter calibrated for 1.0 ips, peak, on the 4-20 mA output, an RMS sinusoidal signal at 0.707 ips, rms, will produce the full 20 mA of loop current.

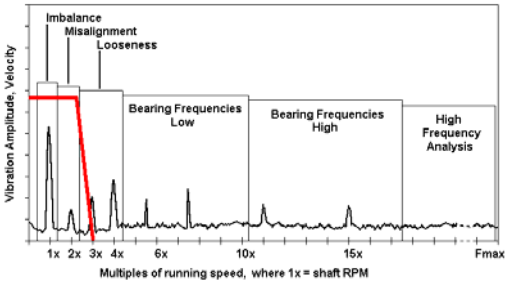


The true peak detection method overcomes the insensitivity of transmitters to short-duration transient events. The peak and RMS calibrated models produce an output signal representative of the overall vibrational energy of the machine. The overall vibration is often the value that should be trended to maintain a good picture of the overall condition of the machine. The ISO standard, in fact, is based on measuring the overall RMS value of the machine vibration. However, when fault conditions for a particular machine can be associated with looseness of components it may be better to use an LPS™ Series transducer that has true peak detection.

Frequency banded transducers

The broad frequency range that the typical 4-20 mA vibration transmitter monitors does not allow for using the typical 4-20 mA transducers for machinery diagnostics. That is because the output is a sum of the total energy of vibration. Machinery diagnostic work requires knowing more about what is happening with the vibration within a narrow range of frequencies.

Frequency banded low frequency velocity sensor



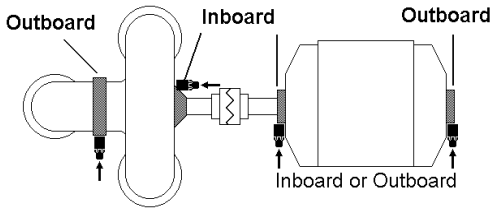
Most work orders generated within plants for maintenance actions are to re-balance or re-align machines. The frequency components generated by balance and alignment problems are at the running speed of machines or twice the running speed. Most plant heavy machinery is motor-driven and the motors typically run at speeds between 600 RPM (10 Hz) and 1200 RPM (20 Hz). Using a transducer that is focused on the frequency span that encompasses imbalance or misalignment frequencies can have a great benefit for maintenance actions.

Wilcoxon now has available special frequency banded 4-20 mA transducers. The PC420VP-10-B3041 uses high-pass and low-pass filters before the detection circuitry to focus the output detection to the range between 3 Hz (180 RPM) and 40 Hz (2400 RPM). The model PC420VP-10-B3041 uses only the frequencies between 3 Hz (180 CPM) and 40 Hz (2400 CPM) to process and compute the vibration level output to the 4-20 mA process loop. This focus of analysis enables users to trend only the low frequencies of vibration associated with balance or alignment problems. These low frequencies are where vibration from unbalance or misalignment will occur on most heavy machines.

The PC420VP-10-B3041 transducer gives plant personnel the opportunity to trend the vibration level at the fundamental running speed for a wide variety of plant machines. For example, a motor or pump running at 1200 RPM has its fundamental speed at 20 Hz. When using the PC420VP-10-B3041 to measure horizontal vibration levels at the bearings, the major contributor to the output vibration level of the PC420VP-10-B3041 frequency banded transducer will be the 1200 RPM (1X) component of shaft vibration.

Separating this running speed (1X) value from all the other potential vibration contributors to the overall vibration level allows plant personnel to determine unbalance effects. This can be particularly important in fan operation. Using the PC420VP-10-B3041 along with a PC420VP-10 transducer will allow personnel to be able to better distinguish the 1X vibration from all the other possible vibration frequencies present.

For plants wanting to fully monitor the balance and alignment condition of machines, three PC420VP-10-B3041 transducers should be used. In this illustration of a motor-pump set the inboard bearing of the pump has thrust bearing capacity. It will be the position that will best indicate any alignment problems. One PC420VP-10-B3041 should be mounted there in the axial direction. Two more PC420VP-10-B3041 transducers should be used to monitor for imbalance, one on each of the shafts.
The outboard pump bearing is the best location on the pump. Either the inboard or the outboard location on the motor can be used, but the position should be guided by historical failure data. Many users favor the inboard location as it can assist in detecting radial vibration problems with the inboard pump bearing.



Top View

Frequency banded high frequency acceleration sensor

Wilcoxon also has available a special high frequency banded acceleration 4-20 mA sensor. The PC420AR-10-3223 uses high-pass and low-pass filters before the detection circuitry to focus the output detection to the range between 300 Hz (18,000 RPM) and 2,000 Hz (120,000 RPM). The model PC420AR-10-3223 uses only the frequencies between 300 Hz and 2,000 Hz to process and compute the vibration level output to the 4-20 mA process loop. This focus of analysis enables users to trend only the frequencies of vibration associated with pump cavitation problems. These frequencies are where vibration from pump cavitation will occur on heavy pumps

Dual output 4-20 mA transducers

The dual output transducers have both a 4-20 mA loop signal output and a broadband dynamic signal output. These types of transducers are useful where plant personnel have portable spectrum analyzer equipment. With the dual output type the user has access to the dynamic vibration signal that is being used to

drive the 4-20mA output loop. This has been very beneficial to many users since they can use their portable FFT analyzer to check the spectrum of the signal. This option is often used in plants with on-site vibration technicians since it permits both the operating and the maintenance personnel to have access to the type of data each needs and only use one transducer. The dynamic output can be either 100 mV/g (acceleration) or 100 mV/ips (velocity).

One of the benefits of the Wilcoxon LPS™ Series transducer family is the ability to have either acceleration or velocity for the dynamic signal regardless of the type of 4-20 mA loop signal. Velocity loop output transducers can have the dynamic output be acceleration or velocity. The same is true for the acceleration loop output transducers which can also have either acceleration or velocity as the dynamic output signal.

Hazardous area installations

Wilcoxon has 4-20 mA transducers certified for hazardous (classified) area installations. The Wilcoxon transducers carry CSA approvals for the U.S. and Canada as well as LCIE ATEX certification. LPS™ Series transducers are available for intrinsically safe installations as well as explosion-proof installations. The intrinsically safe certified units have part numbers ending in IS while the explosion-proof certified units have part numbers ending in EX.

Hazardous area installations

	Approval Agency	Installation Areas
Intrinsically safe model	CSA	CL1, Div 1, GRPS A, B, C, D T3C Ta=85°C Max Exia
Intrinsically safe model	LCIE - ATEX	EEx ia IIC T3 -40°C <= Ta <= 85°C
Explosion proof model	CSA	CLI, Div 1, 2 GRPS A, B, C, D ClII, Div 1, 2 GRPS E, F, G CLIII, DIV 1, 2 T3C Ta=85°C Max
Explosion proof model	LCIE - ATEX	EEx d IIC T3 EEx nA IIC T3 -40°C <= Ta <= 85°C

Appendix - Model number ordering guide

Not all models have all options available. See the individual data sheets each model for option availability.

PC42X selects the type of sensor
PC 420 top exit, connector
PC420Vxx-yy-zz for Velocity 4-20 mA loop output models, and
PC420Axx-yy-zz for Acceleration 4-20 mA loop output models
PC421 side exit, connector
PC421Vxx-yy-zz for Velocity 4-20 mA loop output models, and
PC421Axx-yy-zz for Acceleration 4-20 mA loop output models
PC423 side exit, integral cable
PC423Vxx-yy-zz for Velocity 4-20 mA loop output models, and
PC423Axx-yy-zz for Acceleration 4-20 mA loop output models
PC425 side exit with temperature, connector
PC425Vxx-yy-zz for Velocity 4-20 mA loop output models, and
PC425Axx-yy-zz for Acceleration 4-20 mA loop output models
PC427 side exit with temperature, integral cable
PC427Vxx-yy-zz for Velocity 4-20 mA loop output models, and
PC427Axx-yy-zz for Acceleration 4-20 mA loop output models

All integral cable sensors come standard with 16’ of cable. Alternative lengths of cable must be requested when placing an order. A per-foot charge may apply.

XX selects the type of detection.
R for root-mean-square, RMS
P for equivalent Peak (pseudo-peak)
TP for True Peak

YY selects the full scale range.
For velocity output models the output is in terms of the velocity in inches-per-second (ips). For acceleration output models the output is in terms of the acceleration in g's, where 1g is the gravitational constant. A g is 386 inches-per-second squared or 9.81 meters-per-second squared. Here is a table of the selections:

yy	PC42xV	PC42xA
05	0.5 ips	5 g's
10	1.0 ips	10 g's
20	2.0 ips	20 g's
30	3.0 ips	not available
50	5.0 ips	not available

ZZ selects certain available optional configurations of the PC42x-series units.

zz	Option	Description
DA	Dynamic Acceleration	An additional output wire with 100 mV/g broadband vibration acceleration signal
DV	Dynamic Velocity	An additional output wire with 100 mV/ips broadband vibration velocity signal
EX	Explosion proof case	Class 1, Division I explosion-proof certification[1]
IS	Intrinsically Safe certified	Certified for Class 1, Division I or Zone 0[2]
Blfhf	Frequency Banded	Limited frequencies used for overall calculation[3]

Examples

- A PC420VP-10 is a peak (pseudo-peak) calibrated output with a full scale range of 1.0 inches-per-second.
- A PC420VP-10-DA is a peak (pseudo-peak) calibrated output with a full scale range of 1.0 inches-per-second and has an addition output with a dynamic acceleration signal of 100 mV/g.
- A PC420VP-10-IS would be the same as the PC42-VP-10 described above, but carry an intrinsically safe rating for Zone 0 or Class 1, Division I installations.
- A PC420VP-10-B3041 is a Velocity, Peak calibrated, 1.0 ips full-scale, band-limited 3Hz-to-40Hz.
- A PC420AR-10-B3223 is an acceleration, rms calibrated, 10g full-scale, band-limited 300Hz-to-2,000Hz.

[1] See Wilcoxon PC420Axx-yy-EX or PC420Vxx-yy-EX data sheet for more detailed information
[2] See Wilcoxon PC420Axx-yy-IS or PC420Vxx-yy-IS data sheet for more detailed information
[3] See Wilcoxon PC420VP-10-B3041 data sheet for more detailed information

Frequently asked questions: Intelligent Transmitter Series

The Wilcoxon family of Intelligent Transmitters, relay alarms, and communication modules can be used to implement low-cost online vibration monitoring and simplified machinery monitoring and alarming.

Click on a question below for the answer.

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1. What is the Intelligent Transmitter Series?

The Intelligent Transmitter (*iT*) Series is a complete family of units that provide signal conditioning for simplified online vibration monitoring and provide a Total Lower Cost approach to continuous monitoring. The *iT* Series includes the *iT* Transmitter, *iT* Alarm and *iT* Communication Module.

- The *iT* Transmitter is a signal conditioning module that interfaces with a traditional IEPE accelerometer to provide a 4-20 mA output signal and a buffered dynamic signal. This allows the user to interface an accelerometer with a PLC/DCS system for condition trending, while still providing a dynamic output for more extensive vibration analysis through the BNC connector on the front of the module. The *iT* Transmitter is ordered with custom settings to meet user-specific requirements. *iT* Transmitter models have part numbers in the iT100 and iT200 ranges.

- The *iT* Transmitter pairs with the *iT* Alarm, a DIN-rail mountable alarm with three programmable relays for use in vibration monitoring systems or process control systems. The iT401 Alarm, which compares the 4-20 mA input from the transmitter against user-defined high or low setpoints, triggers the relays and/or provides an alert when the input deviates from acceptable levels. The front panel controls and digital LED readout make this unit very user friendly. The real advantage of this unit is that it can also be used with any 4-20 mA sensor, including pressure, temperature, flow, speed and especially Wilcoxon's popular LPS® vibration sensors.

- The *iT* Communication Module is the only stand-alone digital communication unit for vibration transmitters available today. The *iT* Communication Module receives digital vibration data from the iT Transmitter and sends that data to a computer via an RS232 serial port. Using Wilcoxon's new VibeLink™ software program – provided with the communication module – users have instant online vibration monitoring directly from their desktop for up to eight sensor installations.

2. What applications are *the iT* Series right for?

The *iT* Series is appropriate for industrial, commercial, and municipal facilities that all benefit from machinery health monitoring programs. If physical plant assets are doing the work to process a product, then increases in productivity and efficiency can be realized with a continuous online machinery health monitoring program.

Some of the most common processes to benefit from the *iT* Series are pharmaceutical, food and beverage, brewing, water and waste water, petrochemical, pulp and paper, and power generation facilities. The *iT* Series is effective for monitoring pumps, motors, fans, cooling towers, compressors, and gear boxes. Applying predictive maintenance techniques to these operations and machines can result in significant maintenance expense reductions.

3. What if my application is special?

The *iT* Series allows maintenance professionals to create a custom vibration monitoring center. Each *iT* Transmitter is built to user specifications, and there are options for online monitoring and data trending for every facility, regardless of budget or size.

Options for the *iT* Transmitter now include a selectable full scale that can be specified in English or metric units; measurement of acceleration, velocity or displacement; and four different outputs of r.m.s., peak, true peak, and true peak-to-peak.

Continuous online monitoring is available to large and small facilities alike. For facilities that have a control or monitoring system that accepts four-to-twenty milliamp analog signals, such as a PLC or DCS, these analog input channels are all that is needed to add the benefit of vibration monitoring to your process control. Plants that do not have an existing process monitoring system in place can use the *iT* Communication Module and any computer to achieve the same monitoring benefits for up to eight sensor installations.

4. But I don't have a vibration analyst on staff. Can I still use the *iT* Series?

Moreover, trending of the overall vibration level does not require any sophisticated analysis skills. Observing a sustained increase in overall vibration usually provides enough evidence to warrant a more detailed inspection of the machine.

5. Does the *iT* Transmitter only measure acceleration?

The *iT* Transmitter now measures acceleration, velocity or displacement, as selected at the time the unit is ordered. Displacement measurements indicate overall movement. A displacement transmitter is ideal for applications that requiring the measurement of the machine case movement. Transmitters that measure velocity are most common for measuring overall machine health, and acceleration measurements are best for trending gear mesh or monitoring cavitation where the effect is evidenced in the higher frequency region.

6. What output options are available with the *iT* Transmitter?

Output of 4-20 mA data is offered in terms of r.m.s., peak, and now also in Wilcoxon's exclusive true peak and true peak-to-peak. True peak detection is ideal for measuring short duration vibration, when it is most important to capture and hold maximum absolute instantaneous events. True peak-to-peak detection is designed for use with displacement measurements, which captures and holds the maximum total vibration. The 4-20 mA loop output signal can also represent the true root-mean-square (r.m.s.) value of the vibration signal or the equivalent peak vibration (obtained by multiplying by the ratio of peak to r.m.s., 1.414). Peak and r.m.s. detection are best for general machine health monitoring, when overall vibration is measured.

7. *iT* Transmitter highlights:

Maintenance professionals can order the Intelligent Transmitter with a custom frequency band to meet specific requirements based upon their intended use. The programmed frequency band has a 2-pole high-pass filter and an 8-pole low-pass filter, operates at superior low-noise performance, and measures sensor BOV to monitor sensor performance. Combined, these features ensure the most accurate readings of machinery vibration. Flexible filter frequencies allow users to make field adjustment easily, with no hardware changes; and it is easy to revert back to factory settings.

8. Can one sensor be used with multiple *iT* Transmitter modules?

Yes. The transmitter modules have a provision for sharing a sensor. Also, the TBUS can be used for this sharing as one of the TBUS lines is for the analog sensor signal sharing. IT100/200 Series Transmitter manual contains the details for setting up the sharing arrangement.

9. If two, or more, *iT* Transmitter modules share a sensor, can they be set up with different parameters?

Yes. An accelerometer can be connected to one transmitter module and the sensor input of another transmitter module can be directed to get the signal from the TBUS. The first module could output an acceleration 4-20 mA signal across any desired bandwidth, and the second module could be set up to output velocity across a different bandwidth.

10. What's the TBUS ?

The TBUS is a rear-board connector on each module in the *iT* Series. The transmitter modules place 24 VDC power onto the TBUS along with digital and analog signals. The transmitter only transmits digital data; it does not receive any digital data from the TBUS. In turn, the alarm and communication modules only receive data from the TBUS. They do not transmit data to the transmitter through the TBUS. The alarm and communication modules also receive their power through their TBUS connection.

11. I have a 3-wire (power, common, signal-out) sensor that is biased from 0-5VDC, ±5VDC, or ±10VDC. Can I use the *iT* Transmitters with this?

Absolutely. The transmitter modules contain jumpers which allow you to switch from IEPE (2-wire sensor operation) to 3-wire operation. You may need to capacitively-couple the signal-output of your sensor. Contact a Wilcoxon Applications Engineering for assistance.

12. What kind of filtering exists inside the *iT* Transmitters?

The transmitter modules contain 2-6 poles of "real" high-pass (low-frequency) filtering, depending on calibration frequency. The modules contain 9-12 poles of "real" low-pass (high-frequency) filtering, based on calibration frequency. RC-filters, multiple-feedback (active) filters, and switched-capacitor filters ensure low-power operation with no digital artifacts in the processed signal.

13. If the "manual" mode for setting the filter frequencies is used, is there a way to know for sure what frequency the potentiometer is set to select?

It is possible to know the exact frequency to which the potentiometer is set when the transmitter is used in conjunction with the communication module. One of the pieces of data transmitted to the communication module is the exact frequency setting of the filters. All a user needs to do is to change the filter jumper to "manual" mode, move the potentiometer, then re-connect the transmitter to the communication module and apply power. When the transmitter completes initialization, the frequency setpoints will be available through the communication module.

14. Does the fuse inside an *iT* Transmitter adequately protect the modules?

The fuse is designed to protect the main transmitter module connected to the power supply – in the event too many modules or a module-fault exists anywhere on the TBUS connector. The fuse provides adequate protection if you supply power to the input power-connector of the transmitter module. The fuse is NOT adequate if you supply power directly to the TBUS-connector using a wired-plug.

15. Is the dynamic output (BNC, TBUS, or wired-plug) buffered from the sensor?

Yes. A fault on the TBUS, dynamic-output socket, or front-panel BNC will not impair the 4-20mA loop-current determination from a sensor.

16. Can the Dynamic Output be AC-coupled or DC-coupled in an *iT* Transmitter module?

Yes. Jumper J10 exists inside the transmitter to select AC- or DC-coupling of the buffered sensor output. AC-coupling makes the output +/- with reference to common, DC-coupling makes the output +/- with respect to 1/2 of power-supply (not sensor BOV).

17. Is the sensitivity or internal integration of the *iT* Transmitter field-programmable?

No. You can not alter the sensitivity (input sensor-calibration) or integration settings in the field. These are fixed during calibration at Wilcoxon. You can, however, alter the operating pass-band frequencies of the transmitter by switching the unit to “manual” mode and sdjusting the two potentiometers.

18. *iT* Alarm highlights

The *iT* Alarm includes three programmable relays – high and low setpoints, and a BOV monitor to alert the customer when a sensor or cable connection malfunctions. Each relay can be user-programmed independently to activate if the signal exceeds user-defined limits. The *iT* Alarm connects directly to a plant PLC or DCS network to provide additional capability in process control programs.

Each relay can be user-programmed with delay timers up to 99 seconds to eliminate false alarms that may result from temporary irregular vibrations (such as those that occur when a machine is starting up). Users can set hysteresis levels, allowing alarms to remain active if vibration levels have not returned to normal, but dropped below the alarm setpoint. Each relay can be user-programmed to 1%-accurate high and low alarm setpoints, with a 1V-accurate windowing for a third, BOV-type alarm.

19. Why is the *iT* Alarm module separate, can’t it just be part of the *iT* Transmitter module so there’s only one module?

If the alarms were integral to the transmitter, then the overall cost would be higher and many users would buy a function they do not want. There are also several features that result from the alarm being a separate module:

- Modularity allows several alarm units to operate off of one signal source.
- The alarm is able to directly operate small motors and valves, eliminating the need to link up with a PLC or DCS. Only the iT Alarm uses power relays with the capacity to switch 250VAC, 8A-resistive or 1/3HP inductive machines.
- Having the alarm as a separate unit allows using it with an LPS® 4-20 mA vibration sensor or any 4-20 mA sensor such as temperature, pressure, level, flow, force, and speed.

20. You mean the IT401 can be used with the *iT* Transmitter or any 4-20 mA sensor?

Yep! (You’ve got t’ love a short answer!)

21. The *iT* Alarm has a digital display. What is possible to display on it?

During normal operation the display can be set to indicate the current in the sensor loop in terms of integer values of milliamps, from 2 to 25 mA. It can also be set to display in terms of 0% to 99% of the full-scale 4-20 mA input or transmitter input.

22. Why does the *iT* Alarm use 7-Segments for a display?

Readability. A 7-segment display is readable at greater distances and extreme temperatures over using an LCD (liquid-crystal) display. It costs more to implement, but we thought you were worth it!

23. Why does the *iT* Alarm only have two-digits for a display?

Cost, size, and power-dissipation of more digits are some of the mechanical reasons, but the main reason is accuracy of the display. True, integer values of 4-20mA are potentially large steps, but the display is 1%-accurate when in "percentage-mode." 1%-steps equates to 0.16mA accuracy!

24. There are no potentiometers to adjust on the *iT* Alarm. What does a user access to make alarm setting adjustments?

The front panel has three "membrane" switches. These are used to access and change the settings for the alarm. They are also used to acknowledge an alarm to reset a latched relay.

25. Can the latched alarm be remotely acknowledged?

Yes. There is an input on the module for a remote reset using dry contacts.

26. *iT* Communication Module Highlights

The *iT* Communication Module is currently the only stand-alone digital communication unit for vibration transmitters. It transmits data from the transmitter to any PC or laptop via an RS232 serial port.

The *iT* Communication Module works in conjunction with Wilcoxon's free VibeLink™ software to display data in real time on a monitor, and provides the capability to trend data over time without an external monitoring system. VibeLink™ software displays the information on your PC with both graphing and datalogging capabilities. Up to eight *iT* Communication Modules can be "daisy chain" linked to one serial port allowing up to eight sensor points to be monitored by one computer.

27. Can the *iT* Communication Module be used to change settings in the *iT* Transmitter?

No. The communication module only listens to the transmitter's digital output. Communication between modules is not bi-directional. The communication module takes data that the transmitter continually sends over the TBUS and retains it to respond when it receives a request for data through the RS232 interface.

28. Can one *iT* Communication Module be used with multiple *iT* Transmitters?

No. Since the transmitter only sends data to the TBUS, there is no provision for "negotiating" a bi-directional communication. Therefore, every one transmitter uses one communication module. It is a one-to-one correspondence.

29. What kind of software does my computer need to use the *iT* Communication Module?

Wilcoxon ships a run-time program, VibeLink™, with every communication module. This software will run on Windows XP systems. Otherwise, a simple telnet terminal window can be opened and ASCII commands can be sent to the communication module. The iT501 Communication Module manual outlines the simple command set required. The VibeLink™ software makes all the transmitter module's parameter data available in a window and allows for quick set-up and running of trend data from transmitters.

30. Why would someone use a vibration transmitter when loop-powered 4-20 mA sensors are available?

If the only need is to have a loop-powered sensor for monitoring the overall vibration, then sensors like the Wilcoxon 4-20 mA LPS® series will suffice. However, if very low or very high frequency monitoring is desired, the *iT* Transmitter series is necessary because they have the wide frequency response required. Also, a transmitter is required when it is desired to trend vibration in a limited portion of the frequency spectrum, but have the full spectrum available for detailed FFT analysis.

31. Why would the *iT* Series generally be used instead of other techniques?

Generally, 4-20 mA vibration monitoring is used for equipment that ought to be monitored for vibration, but where access or infrequent servicing is an issue. The *iT* modules present options for installing vibration monitoring. The transmitter allows a 4-20 mA signal to be used for simplified monitoring, while preserving access to the full bandwidth of an accelerometer for detailed vibration spectrum analysis.

The *iT* Alarm allows for local alarm and shutdown capability. The fact that the IT401 can be used with either the *iT* Transmitter or any 4-20 mA sensor offers users greater flexibility. A system can be built for monitoring that utilizes both vibration and process variables for alarming.

Many plant process computers have already utilized all available analog input channels. Adding even just a couple more analog channels may be prohibitively expensive. With the *iT* Alarm, the local processing offered by a combination of an *iT* Transmitter with an *iT* Alarm allows the use of spare digital inputs to the plant process computer. Frequently, there are many unused digital inputs when the analog inputs are full.

By the same token, it may be easier to input data to a plant process computer using an RS232 line. Here is where the *iT* Communication Module can be useful. Since eight (8) modules can be daisy-chained together, it allows eight vibration sensors to be added to a process computer using just one RS232 port. Provisions exist for (64) communication modules to be daisy-chained. Contact Wilcoxon for custom OEM applications.

32. What certifications are there for the *iT* Series modules?

Wilcoxon *iT* Series modules are certified by CSA for CE-compliance. Additional certifications may be possible with proper junction-box enclosures and barrier devices.

33. What accessories are there for the *iT* Series?

Wilcoxon offers DIN enclosures, power supplies, TBUS connectors, fuses and custom cables to complete the *iT* Series. We have developed a great guide to all of the accessories, "iT051 Mounting Box and Configurations." This guide details the setup and required accessories to start an *iT* Series solution. It discusses the size of the DIN enclosure and modules, as well as which TBUS connectors are correct for each setup. It also gives current, voltage, and power supply information.

34. Can an *iT* Series module operate at 12VDC, for battery-applications?

Yes, within limits. Without the recommended +24VDC power, there is insufficient voltage to operate a typical 2-wire IEPE sensor, but the transmitter can certainly operate off +12VDC supply with 3-wire capacitively-coupled sensors. The communication module also operates at +12VDC. The alarm can be special-ordered with 12VDC relays (instead of typical +24VDC relays). Contact Wilcoxon for more information. Note that no certification currently exists for these modules at low-voltage operation.

35. Can I get *iT* Series modules in any color other than green?

Only high-volume OEM applications can be custom-colored. Contact Wilcoxon for more information.