

# Cost-effective predictive maintenance solutions

## Condition-based monitoring is critical to machine reliability

Using preventative and predictive maintenance technologies to track machine health is a proven industry best practice. Monitoring machinery health saves money by increasing plant uptime, reducing outages and avoiding unscheduled downtime, resulting in improved control of spares inventory. Including vibration data in day-to-day planning decreases the time needed to make informed decisions about machinery condition.

Vibration monitoring plays an essential role in predictive maintenance through detection of the vast majority of machinery faults. Trending vibration data allows you to monitor a variety of machines without the need for detailed spectrum analysis. The use of 4-20 mA transmitters establishes a cost-effective condition-based monitoring program that can be used even if you're not a vibration expert.

### Benefits of vibration trending

- >> 4-20 mA data goes right to a process control system, where trends are easy to see
- >> Changes in vibration levels provide warning prior to equipment failures
- >> Simple alarm limits can be set
- >> Spectrum analysis is not necessary



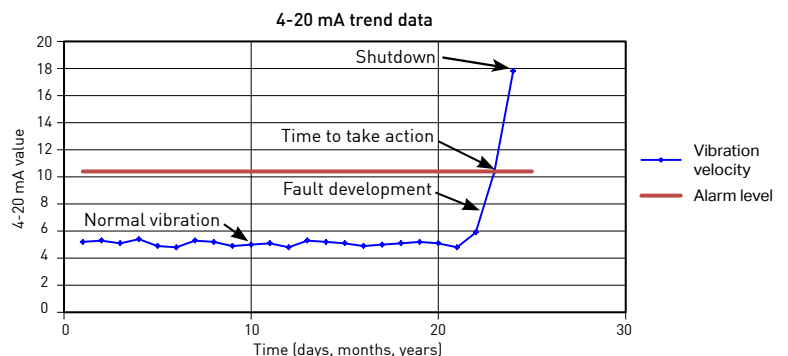
### Simplified condition monitoring

Not a new concept, just a practical approach

- >> Trended data can be used for critical assets when no vibration monitoring program exists, or for balance of plant machinery that is not currently being monitored
- >> Maximize resources and reduce walk around time by focusing only on problem machines

The overall level of vibration is represented by a loop current of 4-20 mA, where 4 mA represents no vibration and 20 mA represents a sensor's full scale vibration level. This loop current indicates general machine health with no complex analysis required when compared against standard vibration guides.

Since many process control systems already accept 4-20 mA inputs, vibration data can be incorporated with common monitoring parameters such as pressure, temperature or flow. Using 4-20 mA vibration transmitters increases the effectiveness of vibration monitoring programs by providing data around the clock, offering a new level of protection.



## 4-20 mA applications



### Pumps

Detection of cavitation can warn of process irregularities, minimize damage, reduce downtime and save money. Wilcoxon Research® model PC420ATP-05-B3223 provides an increasing 4-20 mA output signal when cavitation conditions begin. As cavitation continues, the output is driven even higher, providing ample warning of the destructive condition.



### Motors

As primary components of industrial processes, motors offer the best opportunity for plants to minimize unscheduled downtime and reduce maintenance costs. A single velocity output based sensor mounted on each bearing can warn of a change of condition. ISO 10816-3 standards provide guidelines for quick and easy monitoring of any unit.



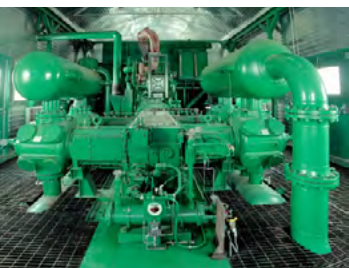
### Fans

Sensors located on pillow blocks of forced draft, induced draft and HVAC fans can monitor bearing conditions including normal wear, early stage bearing fault, foundation looseness and fan balance. Detecting fan failures before damage to surrounding duct work occurs can potentially save thousands of dollars in repair costs.



### Cooling towers

Cooling towers can be monitored using 4-20 mA analog input channels of PLC units. The selection of the appropriate 4-20 mA sensor can help to monitor fan balance, gear mesh frequencies or bearing condition long before catastrophic failure. Fans running below 300 RPM are best monitored using low-frequency accelerometers and iT Transmitters.



### Compressors

Monitoring of compressors requires both low and high frequency information, using a broadband sensor coupled to multiple iT series transmitters offers the best protection. Shaft speed, turbo and gear mesh frequencies can all be present in compressors, posing complex monitoring challenges.



### Gearboxes

Acceleration output 4-20 mA sensors are most effective on high frequency components such as gearboxes because of their ability to include up to the third harmonic of the gear mesh frequencies in the overall value. A dynamic sensor with an appropriate transmitter can also be used when dynamic signal analysis is anticipated.

# The solutions you need



Wilcoxon offers a variety of products for simplified condition-based maintenance programs, including single channel loop powered sensors, IEPE full dynamic sensors capable of integration with PLC, DCS or SCADA systems, and an array of cables, transmitters and other accessories.

## 4-20 mA loop powered sensors

Loop powered sensors (LPS) house an accelerometer, signal conditioner and processor, providing a 4-20 mA output signal proportional to the overall vibration level.

- >> Top or side-exit sensors with or without an integral cable
- >> Selectable full scale values
- >> Acceleration, velocity or displacement models with output signals representative of RMS or peak levels
- >> Temperature probe integrated into the sensor housing provides temperature data at the mounting location
- >> Custom banded sensors with true peak detection for cavitation detection or reciprocating engine monitoring
- >> Hazardous area certifications available



## Cable assemblies

Configure the best assembly for your plant's environment with Wilcoxon's variety of cable and connector options.

- >> IP68 rated cable assemblies
- >> Cables designed for Class I, Division 2 areas
- >> High temperature ratings up to 200°C
- >> Shielded, twisted pair, multi-conductor and coaxial
- >> Exterior stainless steel braid, armor or flexible conduit coverings
- >> Specialized cables and connectors for nuclear environments



## Intelligent transmitters (iT150, iT300, iT301)

Wilcoxon's iT series intelligent vibration transmitters measure and process dynamic vibration signals. iT modules are a powerful means to connect standard vibration sensors to process control systems.

- >> Dual mappable 4-20 mA outputs
- >> Accepts input from accelerometers, velocity sensors or dual output sensors
- >> Easy interface with PLC/DCS/SCADA systems or with portable data collectors via BNC output
- >> Field-configurable parameters allow users to make adjustments easily via a built-in web server (iT300 series only)
- >> Two field-configurable vibration bands and selectable full-scale range (iT300 series only)
- >> Modbus communication, relay mapping and configurable high/low alarm limits (iT301 only)



## iT alarm module

The iT401 programmable relay alarm monitor compares 4-20 mA input against present alarm limits to provide local notification of potential problems.

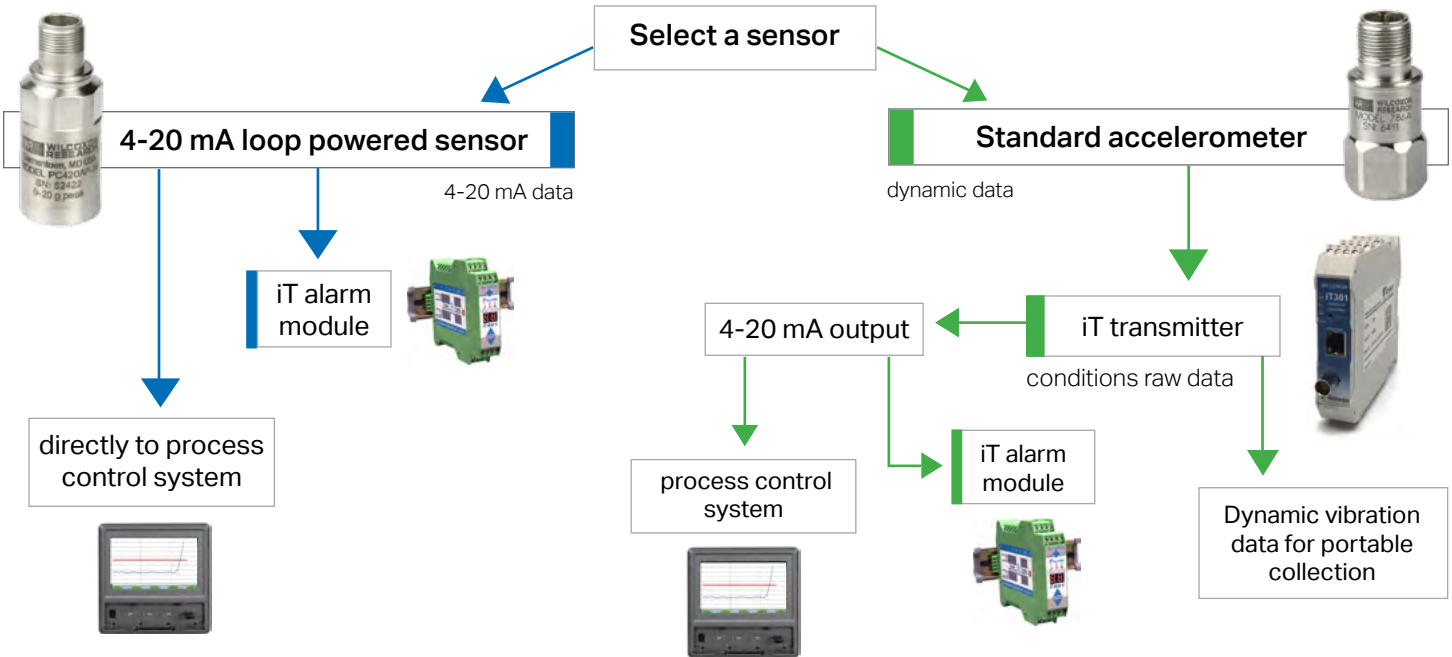
- >> Usable with any iT transmitter or 4-20 mA sensor, including pressure, temperature, flow or speed
- >> Three independently adjustable relays with user-established delays to minimize false alarms and account for start-up conditions
- >> User friendly front LED readout displays real time 4-20 mA data in mA or percentage of full scale output
- >> LED lamps indicate the condition of each relay
- >> Three alarm levels can be set to achieve optimal notifications including early warning or high alarm of shutdown notifications



# Simplified monitoring options

## Choosing the best option

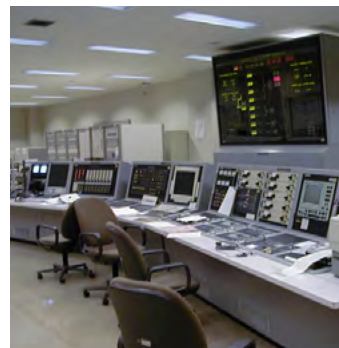
The best approach to 4-20 mA vibration monitoring depends on the requirements of your application. 4-20 mA loop powered sensors can output RMS, peak or true peak trend data directly to an existing process control system or an alarm module, and are a simple, cost-effective option for continuous monitoring. An IEPE accelerometer and intelligent transmitter can be most effective in specialized applications with unusual vibration levels, or if access to dynamic data is needed. A plant's existing monitoring capabilities are also an important consideration.



Benefits	Benefits
<ul style="list-style-type: none"> <li>• Lower total cost of monitoring set-up</li> <li>• Simple trend data for continuous monitoring</li> <li>• Multiple output types (RMS, peak, true peak)</li> </ul>	<ul style="list-style-type: none"> <li>• More detailed information on machine condition</li> <li>• Enables accessibility to dynamic data</li> <li>• Wider sensor selection for more applications</li> </ul>



Portable data collection with route-based tools utilizes a single accelerometer and requires extensive training



Online monitoring systems can easily incorporate 4-20 mA vibration data as part of daily operations

# Reliable machine health monitoring

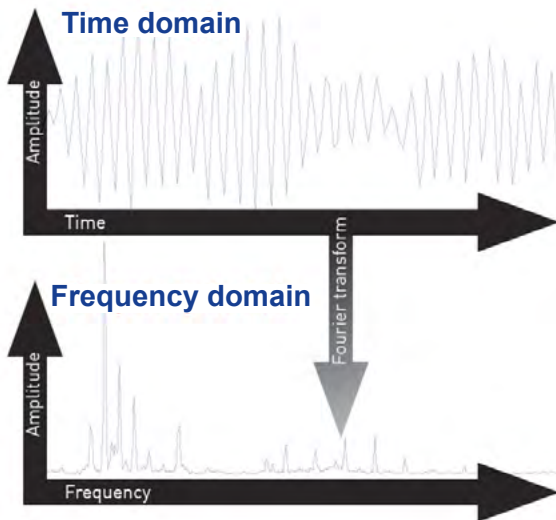
Wilcoxon's iT series intelligent vibration transmitters measure and process dynamic vibration signals. iT modules are a powerful means to connect standard vibration sensors to process control systems. Desired output type and full-scale range are user-configurable, and with optional field-configurable parameters, monitoring can be tailored to meet any requirements.

## Set dangerous operation alerts

ISO 10816-3 standards set forth guidelines for monitoring machines at their bearing positions and includes suggested alarm and trip levels for various machines.

Wilcoxon's iT300 and iT301 transmitters are field-configurable, allowing more precise control over fault monitoring and increased flexibility. The iT301 transmitter features user-configurable high/low alarm limits, mappable to a single NC/NO relay.

ISO 10816-3		Group 1		Group 2	
		Large machines 300 kW < power < 50 MW		Medium machines 15 kW < power < 300 kW	
in/sec peak	mm/sec rms	Motor height >315 mm		Motor 160 mm < height < 315 mm	
0.61	11.0		Damage occurs		
0.39	7.1				
0.25	4.5		Restricted operation		
0.19	3.5				
0.16	2.8		Unrestricted operation		
0.13	2.3				
0.08	1.4				
0.04	0.7	Newly commissioned machinery			
0.00	0.0				
Foundation		Rigid	Flexible	Rigid	Flexible



## Raw vibration data for extensive analysis

The iT transmitter's BNC connector provides access to raw vibration data for further analysis. The AC signal can be routed to handheld data collectors for routine measurements or to an online system for 24/7 monitoring. The signal can also be used for detailed spectrum analysis once a 4-20 mA alarm level has been triggered.

With two processing bands and dual mappable 4-20 mA outputs, iT300 and iT301 transmitters allow users to optimize vibration frequency ranges and access more information from a single sensor.

## Easy vibration trending and monitoring

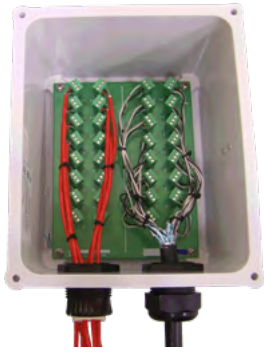
iT transmitters are designed to connect easily to existing plant infrastructure. Two separate 4-20 mA outputs provide data for continuous monitoring, allowing machine health to be trended over time without walkaround data collection.

The iT150 transmitter offers simple plug-and-play capability, ideal for applications where detailed analysis is not necessary. For more complex applications, the built-in web server used with the iT300 and iT301 makes configuration easy and helps ensure that the most meaningful data is captured.

# Enclosures

Wilcoxon offers a wide range of enclosures in a variety of configurations; from simple cable reduction boxes to switched termination boxes, we provide a complete monitoring solution. Options available for boxes include NEMA 4X thermoplastic or stainless steel. Oversized 8"x10"x6" enclosures can easily house a mix and match arrangement of up to 10 iT Transmitters, Alarms, Communication Modules and 24 VDC power supplies. Enclosures for larger channel count systems can house up to 25 units. Larger switch boxes can handle up to 48 channels of accelerometer signals.

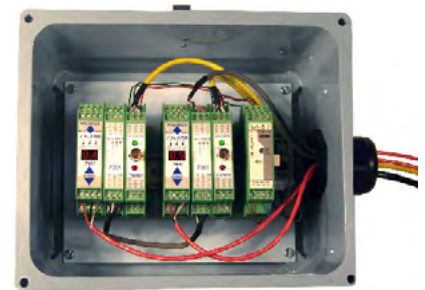
Wilcoxon offers a multi-position cable grip gland for bringing field sensor wiring into the enclosure. Standard conduit fittings are available in sizes up to 1.25". All switchboxes have differential switching (switching of both the signal and common simultaneously). Utilizing differential switching achieves greater noise immunity, resulting in cleaner signals. Other features of Wilcoxon switchboxes include RFI filtering, spacious interiors for easy wiring and parallel BNC or 2 pin MIL connectors in NEMA 4X enclosures.



Reduction boxes



Single channel and triaxial switchboxes



Online continuous monitoring

# Accessories

Mounting bases and studs  
Isolators  
Fin mounts



Magnetic mounting bases  
Mounting pads  
Triaxial mounting cubes



Zerkometer® mounting accessories  
Spot facing tool ST101  
Adhesives





Wilcoxon Sensing Technologies offers vibration monitoring products, which have been used to monitor critical plants and equipment for nearly 60 years. Our state-of-the-art facility is certified to ISO 9001 standards, ensuring the highest quality of manufacturing.

Our sensors are successfully used in a wide range of industries where rotating machinery is critical to plant operation and represents a major asset. Wilcoxon products monitor thousands of machines worldwide, providing data on machine condition to help users identify developing faults early and avoid machine failure and unscheduled downtime.

Vibration monitoring adds value to any predictive maintenance program. Wilcoxon offers the highest quality solutions to help you protect your investment, and reach higher levels of reliability, machine availability and output.



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