

4-20 mA vibration sensors out-perform vibration switches

Newer 4-20 mA technology and products provide better protection and real time vibration monitoring information

Vibration switch weaknesses:

- Switches typically output a “good” or “bad” indicator, and do not offer a vibration signal that can be trended to observe changes in machinery over time. In essence, they provide no advance warning of a fault and by the time they alarm it could be too late.
- Equipment startup typically has high impact or “bump” vibrations, which can cause a switch to trip unless the vibration threshold level is set high. When the trip level is high enough to turn the machine on, it could be set too high to catch faults in advance.
- Vibration switches are made of mechanical components, such as springs, magnets, and lever arms, which can freeze and become inactive.
- Calibration of mechanical vibration switches is imprecise. They can be set too high to catch significant vibratory events, or so low that ambient conditions constantly trip the switch. In this case, the switch is usually disarmed or by-passed, effectively eliminating any protection at all.

Acceleration monitoring weaknesses:

- Mechanical vibration switches are sensitive to acceleration only. They do not measure velocity, which is generally accepted as the best measurement for overall machine condition.
- Vibration switches only detect high impacts and shock, which may indicate early bearing wear, lack of lubrication in gears or bearings, or cavitation. However, these faults can occur without impact-type vibration and go undetected by a switch.
- Impact levels detected when monitoring acceleration decrease over time, even though the machine condition does not improve. Velocity measurements do not occur as early as acceleration but tend to increase over time for a better representation of the machine’s condition.
- No standard warning levels exist to establish known thresholds for acceleration monitoring, such as ISO 10816 guidelines for velocity vibration measurements.



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Advantages of 4-20 mA vibration monitoring:

- Measure velocity, acceleration, or displacement, and have dynamic vibration data available for complete failure mode analysis and fault detection.
- Trust the precise data from reliable sensor readings.
- Reduce nuisance trips caused by high start-up vibrations and non-vibration related events.
- ISO 10816 levels can be used to set thresholds.
- Achieve online monitoring with 4-20mA output, which can be tracked 24/7 through the existing process control system, such as a PLC, DCS, or SCADA.
- Trend data to improve maintenance planning, have confidence in operability, and provide advanced warning of developing faults.
- Dynamic vibration data is available for complete failure mode analysis.
- Wilcoxon accelerometers are extremely reliable, with a Mean Time Between Failure (MTBF) of 25 years.

Table 1		Machinery groups 2 and 4		Machinery groups 1 and 3	
ISO 10816		Rated power			
Velocity		Group 2: 20 hp - 400 hp motors (15 kW - 300 kW) 6.2° ≤ H ≤ 12°		Group 1: 400 hp - 67,000 hp Motors (300 kW - 50 MW) 12° ≤ H	
in/sec peak	mm/sec rms	Group 4: pumps ≥ 20 hp (15 kW) integrated driver		Group 3: pumps ≥ 20 hp (15 kW) external driver	
0.61	11	Damage occurs			
0.39	7.1				
0.25	4.5	Restricted operation			
0.19	3.5	Unrestricted operation			
0.16	2.8				
0.13	2.3	Newly commissioned machinery			
0.08	1.4				
0.04	0.7				
0.00	0.0				
Foundation		Rigid	Flexible	Rigid	Flexible

Replace vibration switches with 4-20 mA vibration monitoring

Vibration switches can be replaced by 4-20 mA vibration sensors or with dynamic sensors and Wilcoxon's Intelligent Transmitter. Both options will result in a more reliable product with better machinery health information. An iT Alarm can be added to achieve a complete standalone monitoring system and replace antiquated mechanical switches.

