

3500/42M Proximator Seismic Monitor

Datasheet

Bently Nevada Machinery Condition Monitoring

Description

The Proximator Seismic Monitor:

- Protects machinery by continuously comparing monitored parameters against configured alarm setpoints to drive alarms.
- Communicates essential machine information to both operations and maintenance personnel.

The Proximator Seismic Monitor is a four-channel monitor that accepts input from proximity and seismic transducers. It conditions the signal to provide vibration and position measurements and compares the conditioned signals with user-programmable alarms.

You can program each channel using the 3500 Rack Configuration Software to monitor and report:

- Radial vibration
- Thrust position
- Differential expansion
- Eccentricity
- REBAM
- Acceleration
- Velocity
- Shaft absolute
- Circular acceptance region



The monitor channels are programmed in pairs and can perform up to two of the listed functions at a time. For example, Channels 1 and 2 can perform one function while channels 3 and 4 perform another or the same function.

Each channel, depending on configuration, typically conditions its input signal to generate various parameters called static values. You can configure **alert setpoints** for each active static value and **danger setpoints** for any two of the active static values.



Specifications

Inputs

Signal	Accepts from 1 to 4 proximity, velocity or acceleration transducer signals
Power consumption	7.7 watts, typical
Input Impedance	
Standard I/O	10 k Ω (Proximitor and acceleration inputs)

Sensitivity

Radial Vibration	3.94 mV/ μ m (100 mV/mil) or 7.87 mV/ μ m (200 mV/mil)
Thrust	3.94 mV/ μ m (100 mV/mil) or 7.87 mV/ μ m (200 mV/mil)
Eccentricity	3.94 mV/ μ m (100 mV/mil) or 7.87 mV/ μ m (200 mV/mil)
Differential Expansion	0.394 mV/ μ m (10 mV/mil) or 0.787 mV/ μ m (20 mV/mil)
REBAM	40 mV/ μ m (1000 mV/mil) or 80 mV/ μ m (2000 mV/mil)
Acceleration & Acceleration ²	10 mV/ (m/s ²) (100 mV/g)
Velocity & Velocity ²	20 mV/ (mm/s) pk (500 mV/ (in/s) pk) or 5.8 mV/ (mm/s) pk (145 mV/ (in/s) pk) or 4 mV/ (mm/s) pk (100 mV/ (in/s) pk)
Shaft Absolute, Radial Vibration	3.94 mV/ μ m (100 mV/mil) or 7.87 mV/ μ m (200 mV/mil)
Shaft absolute, Direct	3.94 mV/ μ m (100 mV/mil) or 7.87 mV/ μ m (200 mV/mil)
Shaft absolute, Velocity	20 mV/ (mm/s) pk (500 mV/ (in/s) pk) or 5.8 mV/ (mm/s) pk (145 mV/ (in/s) pk) or 4 mV/ (mm/s) pk (100 mV/ (in/s) pk)
Circular Acceptance Region	See "Radial Vibration" on page 3.

Outputs

Front Panel LEDs	
OK LED	Indicates when the Proximitor Seismic Monitor is operating properly.
TX/RX LED	Indicates when the Proximitor Seismic Monitor is communicating with other modules in the 3500 rack.
Bypass LED	Indicates when the Proximitor Seismic Monitor is in Bypass Mode.
Buffered Transducer Outputs	The front of each monitor has one coaxial connector for each channel. Each connector is short-circuit protected.
Output Impedance	550 Ω
Transducer Power Supply	-24 Vdc
Recorder	+4 to +20 mA Values are proportional to monitor full-scale. The monitor provides individual recorder values for each channel. Monitor operation is unaffected by short circuits on recorder outputs.
Voltage Compliance (current output)	0 to +12 Vdc range across load Load resistance is 0 to 600 Ω .
Resolution	0.3662 μ A per bit \pm 0.25% error at room temperature \pm 0.7% error over temperature range Update rate approximately 100 ms or less
Shaft Absolute Buffered Outputs	The Shaft Absolute I/O modules have one output for each channel group. Each output is short-circuit protected.
Shaft Absolute Output Impedance	300 Ω
Output supply parameters	See "Output Supply Parameters" on page 10.

Signal Conditioning

Specified at +25 °C (+77 °F) unless otherwise noted.

Radial Vibration

Frequency Response	
Direct filter	User-programmable Single-pole -3db at 4 Hz to 4000 Hz or 1 Hz to 600 Hz ± 1% accuracy
Gap filter	-3 dB at 0.09 Hz
Not 1X filter	60 cpm to 15.8 times running speed Constant Q notch filter Minimum rejection in stopband of -34.9 dB
Smax	0.125 to 15.8 times running speed
1X and 2X vector filter	Constant Q Filter Minimum rejection in stopband of -57.7 dB



1X and 2X Vector, Not 1X, and Smax parameters are valid for machine speeds of 60 cpm to 60,000 cpm.

Accuracy	
Direct and Gap	Exclusive of filtering Within ±0.33% of full-scale typical ±1% maximum
1X and 2X	Within ±0.33% of full-scale typical ±1% maximum
Smax	Within ±5% maximum
Not 1X	±3% for machine speeds less than 30,000 cpm ±8.5% for machine speeds greater than 30,000 cpm

Thrust and Differential Expansion

Accuracy	Within ±0.33% of full-scale typical ±1% maximum
Frequency Response	
Direct filter	-3 dB at 1.2 Hz
Gap filter	-3 dB at 0.41 Hz

Eccentricity

Accuracy	Within ±0.33% of full-scale typical ±1% maximum
Frequency Response	
Direct filter	-3 dB at 15.6 Hz

Gap filter	-3 dB at 0.41 Hz
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Acceleration

Accuracy	Within ±0.33% of full-scale typical ±1% maximum Exclusive of filters
Filter Quality	
High-pass	4-pole (80 dB per decade, 24 dB per octave)
Low-pass	4-pole (80 dB per decade, 24 dB per octave)

The following table shows the frequency ranges if both channels of a channel pair are enabled:

Dual Channel Frequency Response			
Output Type	Without Filter	Low or High Pass Filter	With Integration
RMS	10 to 30,000 Hz	10 to 9,155 Hz	10 to 9,155 Hz
Peak	3 to 30,000 Hz	3 to 9,155 Hz	10 to 9,155 Hz

The following table shows the frequency ranges if a single channel of a channel pair is enabled:

Single Channel Frequency Response		
Output Type	Without Filter Low or High Pass Filter	With Integration
RMS	10 to 30,000 Hz	10 to 14,500 Hz
Peak	3 to 30,000 Hz	10 to 14,500 Hz

Acceleration II

Accuracy	Within ± 0.33% of full scale typical ± 1% maximum Exclusive of filters
Filter Quality	
High-pass	4-pole (80 dB per decade, 24 dB per octave)
Low-pass	4-pole (80 dB per decade, 24 dB per octave)
Frequency Response	
Bias filter	-3 dB at 0.01 Hz
Not OK filter	-3 dB at 2400 Hz
1X and 2X vector filter	Valid for machine speeds of 60 cpm to 100,000 cpm

The following table represents the frequency ranges for the Proximitors Seismic Monitor under different options using the Acceleration II Channel Type:

Output Type	Without Filter Low or High Pass Filter	With Integration
RMS	10 to 30,000 Hz	10 to 20,000 Hz
Peak	3 to 30,000 Hz	10 to 20,000 Hz

Velocity and Velocity II

Accuracy	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum +1% -3% with MTL 764(-) Zener External Barrier Exclusive of filters
Velomitor* sensor accuracy	Full Scale 0-0.5: $\pm 3\%$ typical Full Scale 0-1.0: $\pm 2\%$ typical Full Scale 0-2.0: $\pm 1\%$ typical
Velomitor sensor accuracy with barriers	Under radiated immunity conditions, add $\pm 11\%$ for all full scale ranges. The total Velomitor sensor accuracy will be $\pm 15\%$.

Frequency Response

Bias	-3dB at 0.01 Hz Velocity II only
Not OK filter	-3 dB at 40 Hz Velocity II only
RMS	10 to 5,500 Hz, -3 dB
Peak or peak-to-peak	3 to 5,500 Hz, -3 dB
1X and 2X vector filter	Valid for machine speeds of 60 to 100,000 cpm Velocity II only

Filter Quality

High-pass	4-pole (80 dB per decade, 24 dB per octave)
Low-pass	2-pole (40 dB per decade, 12 dB per octave)

Shaft Absolute, Radial Vibration

Frequency Response

Direct filter	User-programmable 4 Hz to 4000 Hz or 1 Hz to 600 Hz
Gap filter	-3 dB at 0.09 Hz
1X vector filter	Valid for machine speeds of 240 cpm to 60,000 cpm

Accuracy

Direct and gap	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
1X	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum

Shaft Absolute, Velocity

Accuracy	Within $\pm 0.33\%$ of full scale typical $\pm 1\%$ maximum Exclusive of filters
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Frequency Response

Peak or peak-to-peak	User-programmable 3 to 4,000 Hz, -3 dB
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Filter Quality

High-pass	2-pole (40 dB per decade, 12 dB per octave)
Low-pass	2-pole (40 dB per decade, 12 dB per octave)
1X vector filter	Constant Q Filter Minimum rejection in stopband of -57.7 dB

Shaft Absolute Buffered Output

Accuracy	$\pm 6.0\%$ @ 25 C
Circular acceptance region	See "Radial Vibration" on page 3.

REBAM

Frequency Response

Spike	User-programmable from 0.152 to 8678 Hz
Element	User-programmable for BPFO ranging from 0.139 to 3836 Hz High-pass corner is 0.8x BPFO. Low-pass corner is 2.2x BPFO.
Rotor	User programmable from 0.108 to 2221 Hz
Direct	Programmable from 3.906 to 14.2 Hz Selection is determined by Spike and Rotor filters.
Gap	Programmable from 0.002 to 1.0 Hz Selection is determined by the Rotor filter.
1X vector filter	The range of shaft speeds for which the value is valid depends on the nominal shaft speed for which the channel is configured.

The following table summarizes the relationship between nominal shaft speed and the valid speed range:

Nominal Shaft Speed (Hz)	Valid Speed Range (Hz)
10 to <126	0.071 to 160
126 to <252	0.133 to 330
252 to <504	0.25 to 660
504 to 584	0.50 to 750



If a multi-event gear or speed wheel generates the speed input, the upper limitation of the resultant input signal is approximately 20 KHz.

Filter Quality	
Spike high-pass	6-pole Elliptic (155 dB per decade, minimum) Corner frequency is -0.1 dB.
Element bandpass	8-pole Butterworth (155 dB per decade minimum) Corner frequency is -3 dB.
Rotor low-pass	6-pole Elliptic (155 dB per decade, minimum) Corner frequency is -0.1 dB.
Rotor, direct high-pass	1-pole Butterworth (18 dB per decade, minimum) Corner frequency is -3 dB.
Spike, direct low-pass	Corner is -0.3 dB maximum.
Gap low-pass	1-pole Butterworth (18 dB per decade, minimum) Corner frequency is -3 dB.
1X amplitude	Constant Q of 16.67 Stopband frequencies are 0.91 and 1.09 times the running speed. Stopband attenuation is -51 dB minimum.

Accuracy	
Amplitude	Within $\pm 0.33\%$ of full scale typical $\pm 1\%$ maximum when input signal is at the center frequency of the proportional value's passband
Phase	3 degrees error, maximum
Channels enabled	You can use certain configurations to enable only one channel of a channel

pair.

[See "REBAM Channels" on page 19.](#)

Filter Tracking / Stepping (Requires a valid speed signal)

Initial condition	Nominal filter set used
Switch from nominal to lower filter set	Current shaft speed $\leq 0.9 \times$ (nominal shaft speed)
Switch from lower to nominal filter set	Current shaft speed $\geq 0.95 \times$ (nominal shaft speed)
Switch from nominal to higher filter set	Current shaft speed $\geq 1.1 \times$ (nominal shaft speed)
Switch from higher to nominal filter set	Current shaft speed $\leq 1.05 \times$ (Nominal Shaft Speed)
Shaft speed error condition	Nominal filter set used

Physical

Monitor Module (Main Board)

Dimensions (Height x Width x Depth)	241.3 mm x 24.4 mm x 241.8 mm (9.50 in x 0.96 in x 9.52 in)
Weight	0.91 kg (2.0 lb)

I/O Modules (non-barrier)

Dimensions (Height x Width x Depth)	241.3 mm x 24.4 mm x 99.1 mm (9.50 in x 0.96 in x 3.90 in)
Weight	0.20 kg (0.44 lb)

I/O Modules (barrier)

Dimensions (Height x Width x Depth)	241.3 mm x 24.4 mm x 163.1 mm (9.50 in x 0.96 in x 6.42 in)
Weight	0.46 kg (1.01 lb)

Rack Space Requirements

Monitor	1 full-height front slot
I/O Modules	1 full-height rear slot

Barrier Parameters

The following parameters apply to CSA-NRTL/C and ATEX approvals.

Proximitor Barrier	
Circuit Parameters	Vmax (PWR) = 26.80 V (SIG) = 14.05 V Imax (PWR) = 112.8 mA (SIG) = 2.82 mA Rmin (PWR) = 237.6 Ω (SIG) = 4985 Ω
Channel Parameters (entity)	Vmax = 28.0 V Imax = 115.62 mA Rmin (PWR) = 237.6 Ω (SIG) = 4985 Ω
Seismic Barrier	
Circuit Parameters	Vmax (PWR) = 27.25 V Imax (PWR) = 91.8 mA Rmin (PWR) = 297 Ω
Channel Parameters (entity)	Vmax = 27.25 V Imax = 91.8 mA Rmin (PWR) = 297 Ω

Alarms

Alarm Setpoints	Use Rack Configuration Software to set alert levels for each value measured by the monitor and danger setpoints for any two of the values measured by the monitor. Alarms are adjustable from 0 to 100% of full-scale for each measured value. However, when the full-scale range exceeds the range of the transducer, the range of the transducer will limit the setpoint.
Accuracy of alarm setpoints	Within 0.13% of the desired value

Alarm Time Delays

You can program alarm delays using Rack Configuration Software.

For all channel pair types excluding Shaft Absolute Velocity and REBAM	
Alert	From one to 60 seconds in one second intervals
Danger	0.1 seconds or from one to 60 seconds in 0.5 second intervals

Shaft Absolute Velocity	
Alert	From one to 60 seconds in one second intervals
Danger	0.1 seconds or from one to 60 seconds in 0.5 second intervals
REBAM	
Alert	From the calculated minimum value to 400 seconds in one second intervals
Danger	From the calculated minimum value to 400 seconds in 0.5 second intervals