

3500/72M Recip Rod Position Monitor

Product Datasheet

Bently Nevada* Asset Condition Monitoring

Description

The 3500/72M Recip Rod Position Monitor is a four-channel monitor that accepts input from proximity transducers, conditions the signal to provide dynamic and static position measurements, and compares the conditioned signals with user-programmable alarms.

You can program each channel using the 3500 Rack Configuration Software to perform the following functions:

- Rod Position measurement
- Rod Drop measurement
- Hyper-Compressor measurement



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.

The primary purpose of the 3500/72M Recip Rod Position Monitor is to provide the following:

- Machinery protection for reciprocating compressors by continuously comparing monitored parameters against configured alarm setpoints to drive alarms
- Essential reciprocating compressor machine information for operations and maintenance personnel

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



imagination at work

Part Number: 146478-01
Rev. E

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Specifications

Inputs

Signal	Accepts from 1 to 4 proximity probe signals
Input Impedance	10 k Ω
Nominal Scale Factor	
Rod Position	0.79 mV/ μ m (20 mV/mil), 3.94 mV/ μ m (100 mV/mil) or 7.87 mV/ μ m (200 mV/mil)
Rod Drop	3.94 mV/ μ m (100 mV/mil) or 7.87 mV/ μ m (200 mV/mil)
Hyper Compressor	3.94 mV/ μ m (100 mV/mil) or 7.87 mV/ μ m (200 mV/mil) Configuration allows adjustments to accommodate transducer sensitivity for different rod materials.
Power Consumption	7.7 watts, nominal

Outputs

Front Panel LEDs	
OK LED	Indicates when the 3500/72M Recip Rod Position Monitor is operating properly.
TX/RX LED	Indicates when the 3500/72M Recip Rod Position Monitor is communicating with other modules in the 3500 rack.
Bypass LED	Indicates when the 3500/72M Recip Rod Position 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	510 Ω
Transducer Power Supply	-24 Vdc

Data Values

The 3500/72M Recip Rod Position Monitor returns the following data values from measurements used to monitor the machine:

Rod Position Single Channel	Position Magnitude, Position Angle, Crank Angle, Pk-Pk Amplitude, Gap, 1X Amplitude, Not 1X Amplitude, 2X Amplitude
Rod Position Pair Channel	Position Magnitude, Position Angle, Crank Angle, Pk-Pk Amplitude, Gap, 1X Amplitude, Not 1X Amplitude, 2X Amplitude
Rod Drop Channel	Average Piston Position, Average Probe Gap, Instantaneous Piston Position, Instantaneous Probe Gap
Hyper Channel	Pk-Pk Displacement, Gap, 1X Amplitude, Not 1X Amplitude, 2X Amplitude

Signal Conditioning

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

Rod Position Single and Pair Channels

Frequency Response	
Peak-Peak filter	Fixed 1 Hz to 600 Hz
Gap filter	-3 dB at 0.09 Hz
Not 1X filter	Constant Q Notch filter Minimum rejection in stop-band of 34.9 dB over frequency range of 60 cpm 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 and Not 1X parameters are valid for machine speeds of 60 cpm to 2000 cpm.

Accuracy	
Position magnitude (direct)	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
Gap	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
1X Amplitude	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
2X Amplitude	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
Pk-Pk Amplitude	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
Not 1X Amplitude	Within $\pm 3.0\%$ of full scale typical
Position Crank Angle	Within $\pm 1^\circ$ typical $\pm 3^\circ$ maximum
Rod Position Angle (paired only)	Within $\pm 1^\circ$ typical $\pm 3^\circ$ maximum

Rod Drop Channels

Frequency Response	
Average piston position (direct)	Fixed 1 Hz to 600 Hz
Average Gap	-3 dB at 0.09 Hz
Accuracy	
Average piston position (direct)	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
Average Gap	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
Instantaneous piston position	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
Instantaneous probe Gap	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum

Hyper Channels



1X and 2X Vector and Not 1X parameters are valid for machine speeds of 60 cpm to 2000 cpm.

Frequency Response	
Pk-Pk filter	Fixed 1 Hz to 600 Hz
Gap filter	-3 dB at 0.09 Hz
Not 1X filter	Constant Q Notch filter Minimum rejection in stop-band of 34.9 dB over frequency range of 60 cpm to 15.8 times running speed
1X Vector filter	Constant Q filter Minimum rejection in stop-band of 57.7 dB
2X Vector filter	Constant Q filter Minimum rejection in stop-band of 57.7 dB
Accuracy	
Pk-Pk magnitude	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
Gap	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
1X Amplitude	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
2X Amplitude	Within $\pm 0.33\%$ of full-scale typical $\pm 1\%$ maximum
Not 1X Amplitude	Within $\pm 0.33\%$ of full-scale typical

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

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 3500 Rack Configuration Software.

Alert	From one to 60 seconds in one second intervals
Danger	0.1 seconds (nominal) or from one to 60 seconds in one second intervals
Timed OK Channel Defeat	OK Channel defeat is disabled for all Rod Position configurations. As a hyper-compressor monitor, when both transducers are NOT OK, the monitor issues a Danger alarm immediately.

Hazardous Area Approvals



For the detailed listing of country and product specific approvals, refer to the **Approvals Quick Reference Guide**, document 108M1756, at www.GEmeasurement.com.

CSA/NRTL/C (Approval Option 01)	
When used with I/O module ordering options and internal barriers	Ex nC [ia] IIC T4 Gc Class I, Division 1, Groups A, B, C and D Class I, Zone 2/0 AEx nC [ia] IIC T4 Gc Class I, Division 1 Groups A, B, C and D T4 @ -20 °C ≤ Ta ≤ +65 °C (-4 °F to +149 °F) per drawing 138547
When used with I/O module ordering options without internal barriers	Ex nC [L] IIC T4 Gc Class I, Division 2, Groups A, B, C and D Class I, Zone 2 AEx nC IIC T4 Gc Class I, Division 2 Groups A, B, C and D T4 @ -20 °C ≤ Ta ≤ +65 °C (-4 °F to +149 °F) per drawing 149243
ATEX/IECEx (Approval Option 02)	
For ATEX/IECEx agency approval ordering options with internal barriers	 II 3 (1) G Ex nA nC ic [ia Ga] IIC T4 Gc T4 @ -20 °C ≤ Ta ≤ +65 °C (-4 °F to +149 °F)
For ATEX/IECEx agency approval ordering options without internal barriers	 II 3 G Ex nA nC ic IIC T4 Gc T4 @ -20 °C ≤ Ta ≤ +65 °C (-4 °F to +149 °F)

Environmental Limits

Operating Temperature	When used with Internal / External Termination Proximitors / Seismic I/O Module: -30°C to +65°C (-22°F to +149°F) When used with Proximitors / Seismic Internal Barrier I/O Module (Internal Termination) 0°C to +65°C (32°F to +149°F)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Humidity	95% Non-condensing

Compliance and Certifications

EMC	Standards: EN 61000-6-2 Immunity for Industrial Environments EN 61000-6-4 Emissions for Industrial Environments European Community Directives: EMC Directive 2014/30/EU
Electrical Safety	Standards: EN 61010-1 European Community Directives: LV Directive 2014/35/EU

Ordering Information



For the detailed listing of country and product specific approvals, refer to the **Approvals Quick Reference Guide**, document 108M1756, at www.GEmeasurement.com.

Rod Position Monitor 3500/72 - AXX - BXX

A: I/O Module Type

- 01 I/O Module with Internal Terminations
- 02 I/O Module with External Terminations
- 03 I/O Module with Internal Barriers and Internal Terminations

B: Agency Approval

- 00 None
- 01 CSA / NRTL / C (Class I, Division 2)
- 02 ATEX / IECEx / CSA (Class I, Zone 2)

External Termination (ET) Blocks

125808-08	Proximitors / Velomitors External Termination Block Euro Style connectors
128015-08	Proximitors / Velomitors External Termination Block Terminal Strip Connectors
128702-01	Recorder External Termination Block Euro Style Connectors
128710-01	Recorder External Termination Block Terminal Strip Connectors

Ordering Considerations

- For I/O Modules with External Terminations, order the ET Blocks and cable separately for each I/O Module.
- For the Internal Barriers, refer to the 3500 Internal Barrier datasheet, part number 141495-01.
- The 3500/72M Recip Rod Position Monitor requires version 3.20 or higher of the 3500 Rack Configuration Software.

Cables

3500 Transducer (XDCR) to External Termination (ET) Block Cable 129525 - AXXXX - BXX

A: I/O Cable length

- 0005 5 feet (1.5 metres)
- 0007 7 feet (2.1 metres)
- 0010 10 feet (3.0 metres)
- 0025 25 feet (7.6 metres)
- 0050 50 feet (15.2 metres)
- 0100 100 feet (30.5 metres)

B: Assembly instructions

- 01 Not assembled
- 02 Assembled

3500 Recorder Output to External Termination Block Cable 129529 - AXXXX - BXX

A: I/O Cable length

- 0005 5 feet (1.5 metres)
- 0007 7 feet (2.1 metres)
- 0010 10 feet (3.0 metres)
- 0025 25 feet (7.6 metres)
- 0050 50 feet (15.2 metres)
- 0100 100 feet (30.5 metres)

B: Assembly instructions

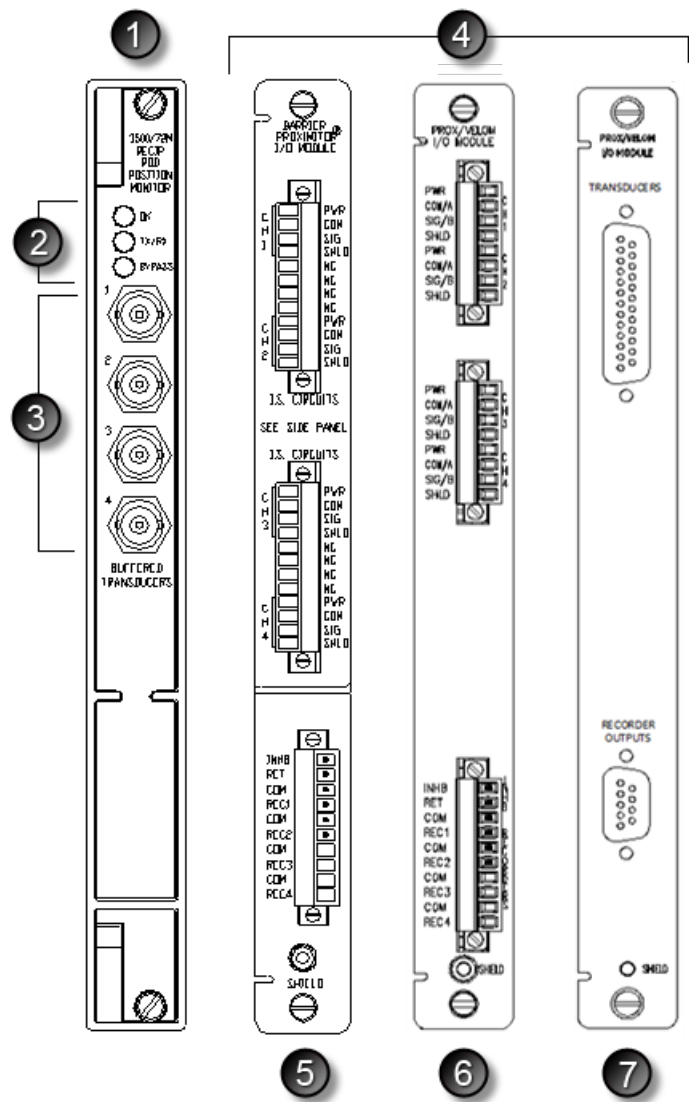
- 01 Not assembled
- 02 Assembled

Spares

176449-08	3500/72M Recip Rod Position Monitor
140471-01	I/O Module with Internal Terminations
00580434	Internal I/O Module connector header Euro Style, 8-pin, green Used with I/O modules 140471-01
140482-01	I/O Module with External Terminations
135489-01	I/O Module with Internal Barriers and Internal Terminations
00580441	Internal I/O Module connector header Euro Style, 3-pin, green Used with I/O modules 135489-01 and 140471-01
00502133	Internal I/O Module connector header Euro Style, 12 pin, blue Used with I/O modules 135489-01
146479-01	3500/72M Recip Rod Position Monitor User Manual

Graphs and Figures

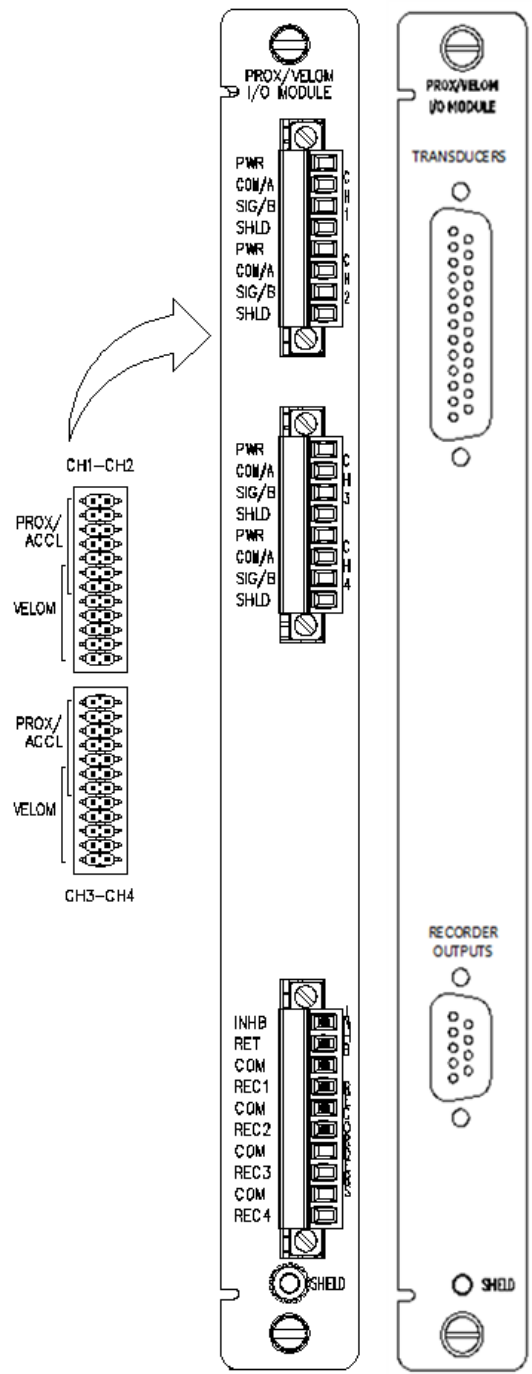
Front and Rear Views of 3500/72M Recip Rod Position Monitor



- 1: 3500/72M Recip Rod Position Monitor Front View
- 2: Status LEDs
- 3: Buffered Transducer Outputs
- 4: I/O Modules Rear Views
- 5: Barrier I/O Module, Internal Termination
- 6: I/O Module, Internal Termination
- 7: I/O Module, External Termination

Side View of I/O Modules

The I/O modules with internal or external terminations have the same jumpers.



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1631 Bently Parkway South, Minden, Nevada USA 89423

Phone: 1-775.782.3611 www.GEmeasurement.com