

Bently Nevada 3500 Series Service Manual

3500/72-01-00

1. Description

3500/72-01-00

3. Product Information

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

Each channel, depending on how you configure it, typically conditions its input signal to generate various parameters called measured values.

Use the 3500 Rack Configuration Software to:

I Configure alert setpoints for each active measured value and danger setpoints for any two of the active measured values.

I Protect reciprocating compressors by continuously comparing monitored parameters against configured alarm setpoints to display alarms and trigger relays, if needed.

I Monitor the condition of essential reciprocating compressor machinery.

The monitor channels are programmed in pairs and can perform up to two 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 3500/72M Recip Rod Position Monitor meets API 618 requirements for reciprocating compressors. It measures:

I Rod position

I Rod drop

I Hyper-compressor

Inputs

Signal Accepts from 1 to 4 proximity probe signals

Input

Impedance 10 kΩ

Nominal Scale Factor

Rod Position

0.79 mV/μm (20 mV/mil),

3.94 mV/μm (100 mV/mil), or

7.87 mV/μm (200 mV/mil)

Rod Position 2

3.94 mV/μm (100 mV/mil), or

7.87 mV/μm (200 mV/mil)

Rod Drop 3.94 mV/μm (100 mV/mil), or

7.87 mV/μm (200 mV/mil)

Hyper

Compressor

3.94 mV/μm (100 mV/mil), or

7.87 mV/μm (200 mV/mil)

Power

Consumption 7.7 watts, nominal

Outputs

Front Panel LEDs

OK LED

Indicates when the Recip

Rod Position Monitor is operating properly.

TX/RX LED

Indicates when the Recip

Rod Position Monitor is

communicating with other
modules in the 3500 rack.

Bypass LED

Indicates when the Recip

Rod Position Monitor is in

Bypass Mode.

Front Buffered Outputs

Buffered

Transducer

Outputs

The front of each monitor

has one coaxial connector

for each channel.

Each connector is shortcircuit 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

Single 2

Channel

Pk-Pk Amplitude

Position Magnitude

Position Angle

Crank Angle

Gap

Average Piston Position

Instantaneous Piston

Position

Instantaneous Probe Gap

Rod Position

Pair Channel

Position Magnitude,

Position Angle,

Crank Angle,

Pk-Pk Amplitude,

Gap,

1X Amplitude,

Not 1X Amplitude,

2X Amplitude

Rod Position

Pair 2 Channel

Pk-Pk Amplitude

Position Magnitude

Position Angle

Crank Angle
Gap
Average Piston Position
Instantaneous Piston
Position
Instantaneous Probe Gap
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
Frequency Response
Peak-Peak filter Fixed 1 Hz to 600 Hz
Gap filter -3 dB at 0.09 Hz
Average piston
position Fixed 1 Hz to 600 Hz
Accuracy
Peak-Peak
Amplitude
Within $\pm 0.33\%$ of full-scale
typical
 $\pm 1\%$ maximum
Position
magnitude
Within $\pm 0.33\%$ of full-scale
typical
 $\pm 1\%$ maximum
Rod Position
Angle
(paired only)
Within $\pm 1^\circ$ typical
 $\pm 3^\circ$ maximum
Position Crank
Angle
Within $\pm 1^\circ$ typical
 $\pm 3^\circ$ maximum
Gap
Within $\pm 0.33\%$ of full-scale
typical
 $\pm 1\%$ maximum
Average piston
position
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

piston gap

Within $\pm 0.33\%$ of full-scale

typical

$\pm 1\%$ maximum

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 stopband 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 2130 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

Accuracy

Rod Position

Angle

(paired only)

Within $\pm 1^\circ$ typical

±3° 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 ±0.33% of full-scale

typical

±1% maximum

Average Gap

Within ±0.33% of full-scale

typical

±1% maximum

Instantaneous

piston position

Within ±0.33% of full-scale

typical

±1% maximum

Instantaneous

probe Gap

Within ±0.33% of full-scale

typical

±1% maximum

Hyper 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 stopband of 34.9 dB over

frequency range of 60 cpm

to 15.8 times running speed

Frequency Response

1X Vector filter

Constant Q filter

Minimum rejection in stopband of 57.7 dB

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 2130 cpm.

Accuracy

Peak-Peak

magnitude

Within ±0.33% of full-scale

typical

±1% maximum

Gap

Within ±0.33% of full-scale

typical

±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

Environmental Limits

Operating

Temperature

When used with Internal /

External Termination

Proximitator / Seismic I/O

Module:

-30°C to +65°C

(-22°F to +149°F)

When used with Proximitator /

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

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

and Rod Drop configurations.

As a hyper-compressor

monitor, when both

transducers are NOT OK, the

monitor issues a Danger

alarm immediately.

Rod Position Monitor

3500/72-01-00

A: I/O Module Type

01= I/O Module with Internal Terminations

B: Hazardous Area Approval Option

00 =None

