Bently Nevada 3500 Series Service Manual

3500/72-01-00

1. Description

3500/72-01-00

3. Product Information

3500/72-01-00 | Bently Nevada Recip Rod Position Monitor

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:

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

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

l 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:

l Rod position

l Rod drop

l 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 ±0.33% of full-scale

typical

±1% maximum

Position

magnitude

Within ±0.33% of full-scale

typical

±1% maximum

Rod Position

Angle

(paired only)

Within ±1° typical

±3° maximum

Position Crank

Angle

Within ±1° typical

±3° maximum

Gap

Within ±0.33% of full-scale

typical

±1% maximum

Average piston

position

Within ±0.33% of full-scale

typical

±1% maximum

Instantaneous

piston position

Within ±0.33% of full-scale

typical

±1% maximum

Instantaneous

piston gap

Within ±0.33% of full-scale

typical

±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 ±0.33% of full-scale

typical

±1% maximum

Gap

Within ±0.33% of full-scale

typical

±1% maximum

1X Amplitude

Within ±0.33% of full-scale

typical

±1% maximum

2X Amplitude

Within ±0.33% of full-scale

typical

±1% maximum

Pk-Pk

Amplitude

Within ±0.33% of full-scale

typical

±1% maximum

Not 1X

Amplitude

Within ±3.0% of full scale

typical

Position Crank

Angle

Within ±1° typical

±3° maximum

Accuracy

Rod Position

Angle

(paired only)

Within ±1° 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 ±0.33% of full-scale

typical

±1% maximum

2X Amplitude

Within ±0.33% of full-scale

typical

±1% maximum

Not 1X

Amplitude

Within ±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

Proximitor / Seismic I/O

Module:

-30°C to +65°C

(-22°F to +149°F)

When used with Proximitor /

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