

3500/45 Position Monitor

Datasheet

Cordant™

141537 Rev. T

Description

The Bently Nevada™ 3500/45 Position Monitor is a 4-channel instrument that accepts input from proximity transducers, Rotary Position Transducers (RPTs), DC Linear Variable Differential Transformers (DC LVDTs), AC Linear Variable Differential Transformers (AC LVDTs), and rotary potentiometers. The monitor conditions the input and compares the conditioned signals with user-programmable alarms.



The type of measurement and transducer input determine which I/O modules are required ([see Transducer Types for Position Measurements on page 12](#); [see Figures and Graphs on page 15](#); and [see I/O Modules for AC LVDTs on page 17](#).)

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

- Axial (thrust) Position
- Differential Expansion
- Standard Single Ramp Differential Expansion
- Non-standard Single Ramp Differential Expansion
- Dual Ramp Differential Expansion
- Complementary Differential Expansion
- Case Expansion
- Valve Position



Baker Hughes

Specifications

Inputs

Signal	Accepts from 1 to 4 signal inputs
Power consumption	7.7 Watts, typical, using Position I/O, or 8.5 Watts typical, using AC LVDT I/O or 5.6 Watts typical, using Rotary Potentiometer I/O
Input Impedance	1 M Ω (DC LVDT inputs) 10 k Ω (Proximitor or RPT inputs) 137 k Ω (AC LVDT inputs) 200 k Ω (Rotary Potentiometer inputs)

Sensitivity

Thrust	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)
Ramp Differential Expansion	0.394 V/mm (10 mV/mil), 0.787 V/mm (20 mV/mil), 3.937 V/mm (100 mV/mil), or 7.874 V/mm (200 mV/mil)
Complementary Input Differential Expansion	0.394 V/mm (10 mV/mil), 0.787 V/mm (20 mV/mil), or 3.937 V/mm (100 mV/mil)

DC LVDT Case Expansion	0.05 V/mm (1.25 V/in), 0.08 V/mm (1.90 V/in), 0.10 V/mm (2.50 V/in), 0.18 V/mm (4.50 V/in), 0.20 V/mm (5.00 V/in), or 0.22 V/mm (5.70 V/in)
AC LVDT Case Expansion	28.74 mV/V/mm (0.73 mV/V/mil), 15.35 mV/V/mm (0.39 mV/V/mil), or 9.45 mV/V/mm (0.24 mV/V/mil)
AC LVDT Valve Position	28.74 mV/V/mm (0.73 mV/V/mil) 15.35 mV/V/mm (0.39 mV/V/mil), 9.45 mV/V/mm (0.24 mV/V/mil), 10.24 mV/V/mm (0.26 mV/V/mil), 7.48 mV/V/mm (0.19 mV/V/mil), 5.51 mV/V/mm (0.14 mV/V/mil), 3.94 mV/V/mm (0.10 mV/V/mil), or 3.15 mV/V/mm (0.08 mV/V/mil)
Rotary Potentiometer Valve Position	41 mV/degree rotation
Rotary Position Transducer (RPT) Valve Position	140 mV/deg rotation, 70 mV/deg rotation, or 50 mV/deg rotation

Outputs

Front Panel LEDs

OK LED	Indicates when the 3500/45 Position Monitor is operating properly.
TX/RX LED	Indicates when the 3500/45 Position Monitor is communicating with other modules in the 3500 rack.

Bypass LED	Indicates when the 3500/45 Position Monitor is in Bypass Mode.
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Transducer Power Supply

Proximitors or RPT	-24 Vdc
DC LVDT	+15 Vdc
AC LVDT	2.3Vrms 3400Hz sine wave
Rotary Potentiometer	-12.38 Vdc
Recorder	+4 to +20 mA Values are proportional to monitor full-scale. The monitor provides individual recorder values for each channel except Ramp and CIDE. 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 μA per bit $\pm 0.25\%$ error at room temperature $\pm 0.7\%$ error over temperature range Update rate 100 ms or less

Signal Conditioning



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

Thrust and Differential Expansion

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

Direct filter	-3 dB at 1.2 Hz
Gap filter	-3 dB at 0.41 Hz

Ramp Differential Expansion

Accuracy	See Ramp Differential Expansion Accuracy on page 14.
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Frequency Response

Direct filter	-3 dB at 1.2 Hz
Gap filter	-3 dB at 0.41 Hz

Complimentary Input Differential Expansion (CIDE)

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

Direct filter	-3 dB at 1.2 Hz
Gap filter	-3 dB at 0.41 Hz

Case Expansion

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

Direct filter	-3 dB at 1.2 Hz
Gap filter	-3 dB at 0.41 Hz

Valve Position

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

Direct filter	-3 dB at 1.2 Hz
Gap filter	-3 dB at 0.41 Hz

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

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)

Rack Space Requirements

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

Alarms

Alarm Setpoints	Use the 3500 Rack Configuration Software to set alert and danger levels for the direct 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 the 3500 Rack Configuration Software from one to 60 seconds in one second intervals.

Alert	From one to 60 seconds in one second intervals
Danger	0.1 seconds or from one to 60 seconds in 0.1 second intervals

Measured Variables



Position measurements are used for machine protection and condition monitoring. The 3500/45 Position Monitor returns values for the following measured variables depending on configuration.

Thrust Position	Direct Gap
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Differential expansion	Direct Gap
Ramp Differential Expansion	Composite Direct Gap
CIDE	Composite Direct Gap
Case expansion	Composite Direct and position
Value position	Direct and position

Environmental Limits

Operating Temperature	When used with Internal/External Termination I/O Module: -30°C to +65°C (-22°F to +150°F)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Humidity	95% Non-condensing

Firmware and Software Requirements

When adding the 3500/45 Position Monitor to an existing 3500 system, the following firmware and software versions or later are required:

- 3500/20 RIM Firmware rev. G
- 3500 Configuration Software 2.41
- 3500 Data Acquisition 2.20
- 3500 Operator Display 1.20
- 3500/93 Display Interface Module 135799-01
- Firmware rev. G
- For Valve Position using RPT, you must have 3500 Configuration Software 3.00 or greater.

Cables

3500 Transducer (XDCR) to External Termination (ET) Block Cable 129525-AAAA-BB

A: I/O Cable Length

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

B: Assembly Instructions

01	Not assembled
02	Assembled

3500 Recorder Output to External Termination (ET) Block Cable 129529-AAAA-BB

A: I/O Cable Length

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

B: Assembly Instructions

01	Not assembled
02	Assembled

Spares

176449-04	3500/45 Position Monitor
135137-01	Position I/O Module with Internal Terminations for use with Proximitors, RPTs or DC LVDTs
135145-01	Position I/O Module with External Terminations for use with Proximitors, RPTs or DC LVDTs
139554-01	AC LVDT Position I/O Module with Internal Terminations for use with AC LVDTs
139567-01	AC LVDT Position I/O Module with External Terminations for use with AC LVDTs
125808-06	Position-Prox/DC LVDT-Euro
141208-01	Position-Prox/AC LVDT-Euro
128702-01	Recorder ET Block-Euro
128015-06	Position External Termination Block (Terminal Strip connectors) for Proximitor, RPT and DC LVDT inputs
128710-01	Recorder External Termination Block (Terminal Strip connectors)
166M4363	Connector Header Push-in-Spring Type (Alternative for PN 00580441)

166M2389	Connector Header Push-in-Spring Type (Alternative for PN 00580434)
166M2388	Connector Header Push-in-Spring Type (Alternative for PN 00580432)
166M2379	Connector Header Push-in-Spring Type (Alternative for PN 00580443)