3500/50M Tachometer Module

Datasheet

Bently Nevada Machinery Condition Monitoring

Description

The 3500/50M Tachometer Module is a 2-channel module that accepts input from proximity probes or magnetic pickups to determine shaft rotative speed, rotor acceleration, or rotor direction. The module compares these measurements against user-programmable alarm setpoints and generates alarms when the setpoints are violated.

The Tachometer Module is programmed using the 3500 Rack Configuration software. The following configuration options are available:

- Speed Monitoring, Setpoint Alarming and Speed Band Alarming
- Speed Monitoring, Setpoint Alarming and Zero Speed Notification
- Speed Monitoring, Setpoint Alarming and Rotor Acceleration Alarming
- Speed Monitoring, Setpoint Alarming and Reverse Rotation Notification

The Tachometer Module can be configured to supply conditioned Keyphasor signals to the backplane of the 3500 rack for use by other monitors. Therefore, you don't need a separate Keyphasor module in the rack.

The 3500/50M Tachometer Module has a peak hold feature that stores the highest speed, the highest reverse speed, or the number of reverse rotations that the machine has reached. You can reset the peak values.

Bently Nevada offers an Overspeed Protection System (Product 3701/55).
WARNING

PRODUCT MISUSE
Risk of personal injury or equipment damage.

Do not use Tachometer Module independently or as a component of a speed control or an overspeed protection system because it does not provide protective redundancy or the response speed needed for reliable operation as a speed control or overspeed protection system.

The analog proportional output is suitable for data logging, chart recording, or display purposes only. Speed alert setpoints are suitable for annunciation purposes only.

Magnetic Pickups:
Do not use magnetic pickups for the reverse rotation option or zero speed option. Otherwise, false indications of rotation direction may occur. The transducers do not provide a clean edge for the detection circuit during low speeds.
## Specifications

### Inputs

<table>
<thead>
<tr>
<th>Signal</th>
<th>Each Tachometer Module accepts up to two transducer signals from proximity probe transducers or magnetic pickups.</th>
</tr>
</thead>
</table>
| Input signal range | +10.0 V to -24.0 V  
Signals exceeding this range are limited internally by the module. |
| Input impedance | 20 kΩ (standard)  
40 kΩ (TMR)  
7.15 kΩ (Internal Barrier) |
| Power consumption | 5.8 watts, typical |
| Transducers | Accepts 1 to 2 proximity transducer signals  
Restrictions may apply to magnetic pickups. See the Warning earlier in the document. |

### Outputs

#### Front Panel LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK LED</td>
<td>Indicates when the 3500/50M Tachometer Module is operating properly.</td>
</tr>
<tr>
<td>TX/RX LED</td>
<td>Indicates when the Tachometer Module is communicating with other modules in the 3500 rack.</td>
</tr>
<tr>
<td>Bypass LED</td>
<td>Indicates when the Tachometer Module is in Bypass Mode.</td>
</tr>
</tbody>
</table>

#### Buffered Transducer

| Outputs | The front of each module has one coaxial connector for each channel.  
Each connector is short circuit and ESD protected.  
Buffered outputs are available at the I/O module via Euro style connectors. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Impedance</td>
<td>550 Ω</td>
</tr>
<tr>
<td>Transducer Power Supply</td>
<td>24 Vdc, 40 mA maximum per channel</td>
</tr>
</tbody>
</table>
| Recorder | +4 to +20 mA  
Values are proportional to module full-scale range (rpm or rpm/min).  
Individual recorder values are provided for each channel. |

### Signal Conditioning

Specified at +25 °C (+77 °F)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Input</td>
<td></td>
</tr>
</tbody>
</table>
The 3500/50M Tachometer Module supports 1 to 255 events per revolution for Rotor Acceleration and Zero Speed channel types.  
All other channel types support 0.0039 to 255 events per revolution.  
All channel types support a maximum full scale range of 99,999 rpm and a maximum input frequency of 20 kHz.  
Minimum input frequency for proximity transducers is 0.0167 Hz (1 rpm for 1 event per revolution).  
Minimum input frequency for passive magnetic pickups is 3.3 Hz. |
| RPM Accuracy | Less than 100 rpm = ±0.1 rpm  
100 to 10,000 rpm = ±1 rpm  
10,000 to 99,999 rpm = ±0.01% of true shaft speed |
| RPM/Min Accuracy | ±20 rpm/min |

### Transducer Conditioning

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
</table>
| Auto Threshold | Use for any input above 0.0167 Hz (1 rpm for 1 event/revolution)  
Minimum signal amplitude for triggering is 1 volt peak-to-peak. |
| Manual Threshold | User selectable from +9.5 Vdc to -23.5 Vdc  
Minimum signal amplitude for triggering is 500 millivolts peak-to-peak |
| Hysteresis | User selectable from 0.2 to 2.5 volts |
Alarms

Alarm Setpoints
- Alarm 1 levels (setpoints) can be set for each value measured by the Tachometer.
- Alarm 2 setpoints can be set for any two of the values measured by the Tachometer.
- Alarm setpoints are set using software configuration.
- Alarms are adjustable and can normally be set from 0 to 100% of full scale for each measured value.

Alarm Time Delays
- Programmable alarm delays for Alarm 1 and Alarm 2
- Alarm 1 Time Delay: From 1 to 60 seconds in 1 second intervals
- Alarm 2 Time Delay: From 1 to 60 seconds in 0.1 second intervals

Measured Values

Measured values are speed measurements used to monitor a machine. The 3500/50M Tachometer Module returns the following measured values:

<table>
<thead>
<tr>
<th>Category</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor Speed</td>
<td>Speed&lt;sup&gt;1&lt;/sup&gt; Speed Band, Peak Speed&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Rotor Speed 2</td>
<td>Speed&lt;sup&gt;1&lt;/sup&gt; Gap, Speed Band, Peak Speed&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Rotor Acceleration</td>
<td>Rotor Acceleration&lt;sup&gt;1&lt;/sup&gt; Speed, Peak Speed&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Rotor Acceleration 2</td>
<td>Rotor Acceleration&lt;sup&gt;1&lt;/sup&gt; Gap, Speed, Peak Speed&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Zero Speed</td>
<td>Zero Speed&lt;sup&gt;1&lt;/sup&gt; Speed, Peak Speed&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Zero Speed 2</td>
<td>Zero Speed&lt;sup&gt;1&lt;/sup&gt; Gap, Speed, Peak Speed&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Reverse Rotation</td>
<td>Reverse Speed&lt;sup&gt;1&lt;/sup&gt; Speed, Peak Speed (forward), Gap&lt;sup&gt;2&lt;/sup&gt;, Num Reverse Rotations</td>
</tr>
</tbody>
</table>

1 The primary value for the channel. This value can be included in contiguous registers in the Communications Gateway Module.
2 This measured value is for display and setup purposes only. No alarms are provided.

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: 0.82 kg (1.8 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 (internal 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 Module: 1 full-height front slot
- I/O Modules: 1 full-height rear slot
Compliance and Certifications

FCC
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

EMC
European Community Directive:
EC Directive 2014/30/EU
Standards:
EN 61000-6-2 Immunity for Industrial Environments
EN 61000-6-4 Emissions for Industrial Environments

Electrical Safety
European Community Directive:
LV Directive 2014/35/EU
Standards:
EN 61010-1

RoHS
European Community Directive:
RoHS Directive 2011/65/EU

Maritime
ABS - Marine and Offshore Applications
DNV GL Rules for Classification – Ships, Offshore Units, and High Speed and Light Craft

Hazardous Area Approvals


CSA/NRTL/C
When used with I/O module ordering options without internal barriers

- Class I, Zone 2: AEx/Ex nA nC ic IIC T4 Gc;
- Class I, Zone 2: AEx/Ex ec nC ic IIC T4 Gc;
- Class I, Division 2, Groups A, B, C, and D;
- T4 @ Ta= -20°C to +65°C (-4°F to +149°F)
- When installed per drawing 149243 or 149244.

When used with I/O module ordering options with internal barriers

- Class I, Zone 2: AEx/Ex nA nC ic [ia Ga] IIC T4 Gc;
- Class I, Zone 2: AEx/Ex ec nC ic [ia Ga] IIC T4 Gc;
- Class I, Division 2, Groups A, B, C, and D (W/ IS Output for Division 1)
- T4 @ Ta= -20°C to +65°C (-4°F to +149°F)
- When installed per drawing 138547.

ATEX/IECEEx

When used with I/O module ordering options without internal barriers

- Ex nA nC ic IIC T4 Gc;
- Ex ec nC ic IIC T4 Gc;
- T4 @ Ta= -20°C to +65°C (-4°F to +149°F)
- When installed per drawing 149243 or 149244.

When used with I/O module ordering options with internal barriers

- Ex nA nC ic [ia Ga] IIC T4 Gc;
- Ex ec nC ic [ia Ga] IIC T4 Gc;
- T4 @ Ta= -20°C to +65°C (-4°F to +149°F)
- When installed per drawing 138547.
Ordering Considerations

To add the 3500/50M Tachometer Module to an existing 3500 Monitoring System, you must have the following versions of firmware and software:

<table>
<thead>
<tr>
<th>Firmware and Software</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>3500/22M Module Firmware</td>
<td>Revision (1.70)</td>
</tr>
<tr>
<td>3500/01 Configuration Software</td>
<td>Version 4.20 or later</td>
</tr>
<tr>
<td>3500/02 Data Acquisition Software</td>
<td>Version 2.52 or later</td>
</tr>
<tr>
<td>3500/03 Display Software</td>
<td>Version 1.52 or later</td>
</tr>
<tr>
<td>3500/50M Firmware</td>
<td>Revision 5.30 or later</td>
</tr>
<tr>
<td>3500/50M</td>
<td>Not compatible with any version of 3500/20</td>
</tr>
</tbody>
</table>

Consider the following guidelines and restrictions before placing an order:

- External Termination Blocks cannot be used with Internal Termination I/O modules.
- When ordering I/O Modules with External Terminations, you must order External Termination Blocks and cables separately.
- Use Bussed External Termination Blocks with TMR I/O modules only.
- Before selecting the Internal Barrier option, see 3500 Internal Barriers product datasheet (document 141495).
Ordering Information


3500/50M Tachometer Module
3500/50-AA-BB

A: I/O Module Type
01 I/O Module with Internal Terminations
02 I/O Module with External Terminations
04 I/O Module with Internal Barriers and Internal Terminations

B: Hazardous Area Approval Option
00 None
01 CSA/NRTL/C (Class 1, Division 2)
02 ATEX/IECEx/CSA (Class 1, Zone 2)

External Termination (ET) Blocks

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>125808-05</td>
<td>Tachometer ET Block Euro Style connectors</td>
</tr>
<tr>
<td>128015-05</td>
<td>Tachometer ET Block Terminal Strip connectors</td>
</tr>
<tr>
<td>128702-01</td>
<td>Recorder ET Block Euro Style connectors</td>
</tr>
<tr>
<td>128710-01</td>
<td>Recorder ET Block Terminal Strip connectors</td>
</tr>
</tbody>
</table>

Cables

3500 Tachometer Signal to ET Block Cable
135101-AAAA-BB

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 ET Block Cable
129529-AAAA-BB

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

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>288062-02</td>
<td>3500/50M Tachometer Module</td>
</tr>
<tr>
<td>133442-01</td>
<td>I/O Module with Internal Terminations</td>
</tr>
<tr>
<td>136703-01</td>
<td>Discrete Internal Barrier I/O Module with Internal Terminations</td>
</tr>
<tr>
<td>133434-01</td>
<td>I/O Module with External Terminations</td>
</tr>
<tr>
<td>133450-01</td>
<td>TMR I/O Module with External Terminations</td>
</tr>
<tr>
<td>134938</td>
<td>3500/50M Tachometer User Guide</td>
</tr>
<tr>
<td>04425545</td>
<td>Grounding Wrist Strap Single use only</td>
</tr>
<tr>
<td>00580434</td>
<td>Connector Header Internal Termination 8-position Green</td>
</tr>
<tr>
<td>00580436</td>
<td>Connector Header Internal Termination 6-position Green</td>
</tr>
<tr>
<td>00502133</td>
<td>Connector Header Internal Termination 12-position Blue</td>
</tr>
</tbody>
</table>
Graphs and Figures

1. Status LEDs
2. Buffered transducer outputs
3. I/O Module, Internal Terminations
4. I/O Module, External Terminations
5. I/O Module, TMR, External Terminations
6. I/O Module, Internal Barrier, Internal Terminations

Figure 1: Front and Rear Views of the 3500/50M Tachometer Module