3500/25 Enhanced Keyphasor Module

Datasheet

Bently Nevada Machinery Condition Monitoring

141532 Rev. T

Description

The 3500/25 Enhanced Keyphasor Module is a half-height, two-channel module used to provide Keyphasor signals to the monitor modules in a 3500 rack. The module receives input signals from proximity probes or magnetic pickups and converts the signals to digital Keyphasor signals that indicate when the Keyphasor mark on the shaft coincides with the Keyphasor transducer. The 3500 Machinery Protection System can accept up to four Keyphasor signals for normal configuration and up to eight Keyphasor signals in a paired configuration.

Keyphasor signal is a once-per-turn or multiple-event-per-turn pulse from a rotating shaft or gear used to provide a precise timing measurement. This allows 3500 monitor modules and external diagnostic equipment to measure shaft rotative speed and vector parameters such as 1X vibration amplitude and phase.

The Enhanced Keyphasor Module is an improved 3500 system module. It offers expanded Keyphasor signal processing capabilities over the previous design while maintaining complete downward-compatibility in terms of form, fit and function with existing Keyphasor modules for use in legacy systems. The Keyphasor module, PWA 125792-01, is completely replaced by the updated 149369-01 module.

When a system Keyphasor input is required for Triple Modular Redundant (TMR) applications, the 3500 system should employ two Keyphasor modules. In this configuration, the modules work in parallel to provide both a primary and secondary Keyphasor signal to the other modules in the rack.

A system with more than four Keyphasor inputs may use a paired configuration provided there are no more than four

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primary Keyphasor input signals. A paired configuration requires two consecutive monitoring positions in either the upper/lower or both half-slot positions. Four Keyphasor modules will accept four primary and four backup input channels and provide four output channels (one per module). A configuration of two paired and one non-paired (three Keyphasor modules total) is also possible. In such a configuration, the user may configure the one non-paired Keyphasor (order either two 2-channel or one 1-channel and one 2-channel option)

The Isolated Keyphasor I/O module is designed for applications where the Keyphasor signals are tied in parallel to multiple devices and require isolation from other systems, such as a control system. The Isolated I/O module was created specifically for Magnetic Pickup applications but is compatible with and will provide isolation for Proximitor* applications as long as an external power supply is provided.

The intent of this I/O module was primarily to measure shaft speed and not phase. The module can provide phase measurements, but this I/O introduces a slightly higher phase shift than the Non-Isolated I/O version. Figure 1 shows the amount of phase shift that the Isolated I/O modules will add at different machine speeds.

Enhanced product features include generation of once-per-turn event signals from multi-event-per-turn inputs, field-upgradeable firmware, and asset management data reporting.

Specifications

Inputs

Power Consumption	3.2 Watts typical
Signal	Each Keyphasor Module accepts up to two transducer signals from proximity probe transducers or magnetic pickups. The input signal range is +0.8 V to -21.0 V (NonIsolated I/O modules) or +5V to -11V (Isolated I/O modules). Signals exceeding this range are limited internally by the module. Passive magnetic pickups require a shaft rotative speed greater than 200 rpm (3.3 Hz).
Input Impedance	21.8 k Ω minimum

Signal Conditioning

Speed/ Frequency Signal Ranges	Input range of 1 to 1,200,000 cpm (0.017 to 20 kHz). Supports multiple events per revolution to a maximum of 20 kHz. Output range of 1 to 99,999 cpm (0.017 to 1667 Hz)
Speed/ Frequency Signal Accuracy	Specified at +25°C (+77°F).
Non-processed Signals	0.017 to 100 Hz ... ±1 cpm 101 to 500 Hz ... ±8 cpm 501 to 20 kHz ... ±1% of cpm
Processed Signals	0.017 to 60 Hz ... ±1 cpm 61 to 150 Hz ... ±8 cpm 151 to 20 kHz ... ±1% of cpm

Transducer Conditioning

Auto Threshold	Minimum signal amplitude for triggering is 2 volts peak to peak and minimum frequency is 120 rpm (2 Hz).
Manual Threshold	Use for any input above 0.017 Hz (1 rpm for 1 event per revolution). User-selectable from 0 to -20 volts dc. Minimum signal amplitude for triggering is 500 millivolts peak to peak.
Hysteresis	User-selectable from 0.2 to 2.5 Volts.

Outputs

Buffered Keyphasor Signals	Two buffered Keyphasor outputs are available at the front of the rack via coaxial connectors. Two buffered Keyphasor outputs are also available at the back of the rack via Euro Style connectors.
Output Impedance	504 Ω maximum buffered output impedance.
Keyphasor Transducer Power Supply	-24 Vdc, 40 mA maximum per channel.
Front Panel LEDs	
OK LED	Indicates when a fault has been detected in the Keyphasor Module.
TX/RX LED	Indicates when the Keyphasor Module is communicating with the Rack Interface Module (RIM).

Environmental Limits

Operating Temperature	-30°C to +65°C (-22°F to +150°F) when used with Keyphasor I/O Module other than the Internal Barrier version. 0°C to +65°C (32°F to +150°F) when used with Keyphasor Internal Barrier I/O Module (Internal Termination).
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Humidity	95%, non-condensing

Physical

Main Module	
Dimensions Height x Width x Depth)	119.9 mm x 24.4 mm x 256.5 mm (4.72 in x 0.96 in x 10.10 in).
Weight	0.34 kg (0.76 lbs.)
I/O Module	
Dimensions (Height x Width x Depth)	241.3 mm x 24.4 mm x 103.1 mm (9.50 in x 0.96 in x 4.06 in)
Weight	0.46 kg (1.01 lbs.).

Rack Space Requirement

Main Module	1 half-height front slot The half-height main modules require a special mounting adapter for mounting in the full-height slots. The user can place the main modules in any one of the 14 available slots. Each rack may have no more than two main modules, one in a top half-slot and one in a bottom half-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:

EMC 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

For the detailed listing of country and product specific approvals, refer to the *Approvals Quick Reference Guide* (108M1756) available from Bently.com.

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/IECEx

When used with I/O module ordering options without internal barriers	Ex II 3 G 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 II 3(1) G 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

General

- External Termination (ET) Blocks cannot be used with Internal Termination I/O modules.
- When ordering I/O Modules with External Terminations, the External Termination Blocks and Cables must be ordered separately.
- There are many technical considerations involved in using the expanded signal processing functions of the Enhanced Keyphasor Module. A qualified Bently Nevada sales representative should be consulted prior to specifying or ordering modules for such applications.

Internal Barrier I/O Module

Consult the 3500 Internal Barrier specification sheet document (141495) if the Internal Barrier Option is selected.

Ordering Information

For the detailed listing of country and product specific approvals, refer to the *Approvals Quick Reference Guide* (108M1756) available from Bently.com.

Enhanced Keyphasor Module

3500/25-AA-BB-CC

A: Number of channels	
01	Single half-height 2-channel Keyphasor card (order for 2-channels)
02	Two half-height 2-channel Keyphasor cards (order for 4-Channels)
B: Type of I/O Module	
01	I/O module with Internal Terminations
02	I/O module with External Terminations
03	Internal Barrier I/O with Internal Terminations
04	Isolated I/O module with Internal Terminations (Designed for use with Magnetic Pickups)
05	Isolated I/O module with External Terminations (Designed for use with Magnetic Pickups)
C: Agency Approval Option	
00	Not required
01	CSA/NRTL/C (Class 1, Div 2)
02	ATEX/IECEx/CSA (Class 1 Zone 2)

External Termination Blocks

128718-01	Keyphasor External Termination Block (Euro Style Connectors)
128726-01	Keyphasor External Termination Block (Terminal Strip Connectors)

Cables

3500 Keyphasor (KPH) Signal to External Termination (ET) Block Cable

129530-AAAA-BB

A:Cable Length	
0005	5 feet (1.5 metres)
0007	7 feet (2.1 metres)
0010	10 feet (3 metres)
0025	25 feet (7.5 metres)
0050	50 feet (15 metres)
0100	100 feet (30.5 metres)
B: Assembly Instructions	
01	Not assembled
02	Assembled

Spares

149369-01	Enhanced Keyphasor Module

This module may be ordered as a direct plug-in replacement for Keyphasor Module 125792-01.

125800-01	Keyphasor I/O Module (Internal Terminations)
126648-01	Keyphasor I/O Module (External Terminations)
125800-02	Isolated Keyphasor I/O Module (Internal Terminations) (Designed for use with Magnetic Pickups)
126648-02	Isolated Keyphasor I/O Module (External Terminations) (Designed for use with Magnetic Pickups)
135473-01	Keyphasor I/O Module (Internal Barriers and Internal Terminations.
04425545	Grounding Wrist Strap (single use)
00580438	Connector Header, Internal Termination, 4-Position, Green
00502133	Connector Header, Internal Termination, 12-Position, Blu
129770	Keyphasor Module User Guide
Half-height Blank Monitor Cover Kit	
131151-01	Half-height Blank Front Panel Cover (qty 1, includes screws)

Half-height Card Adapter

125388-01	Half-height Chassis
125565-01	Card Guide
04300111	Assembly Screws (Order Qty. 3)

Graphs and Figures

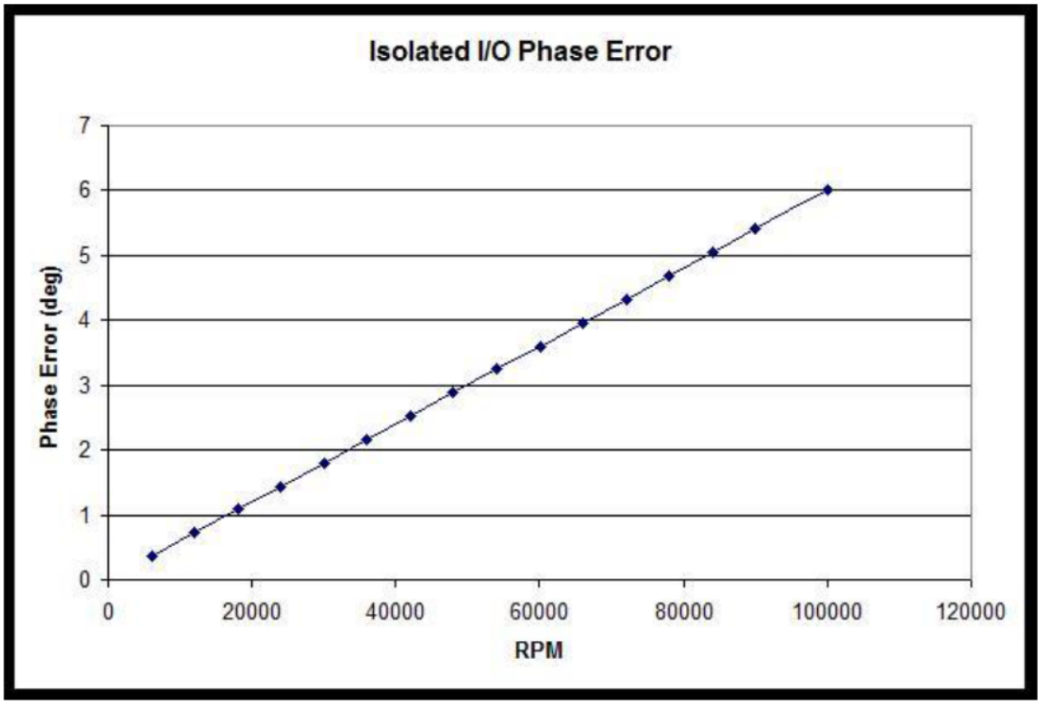
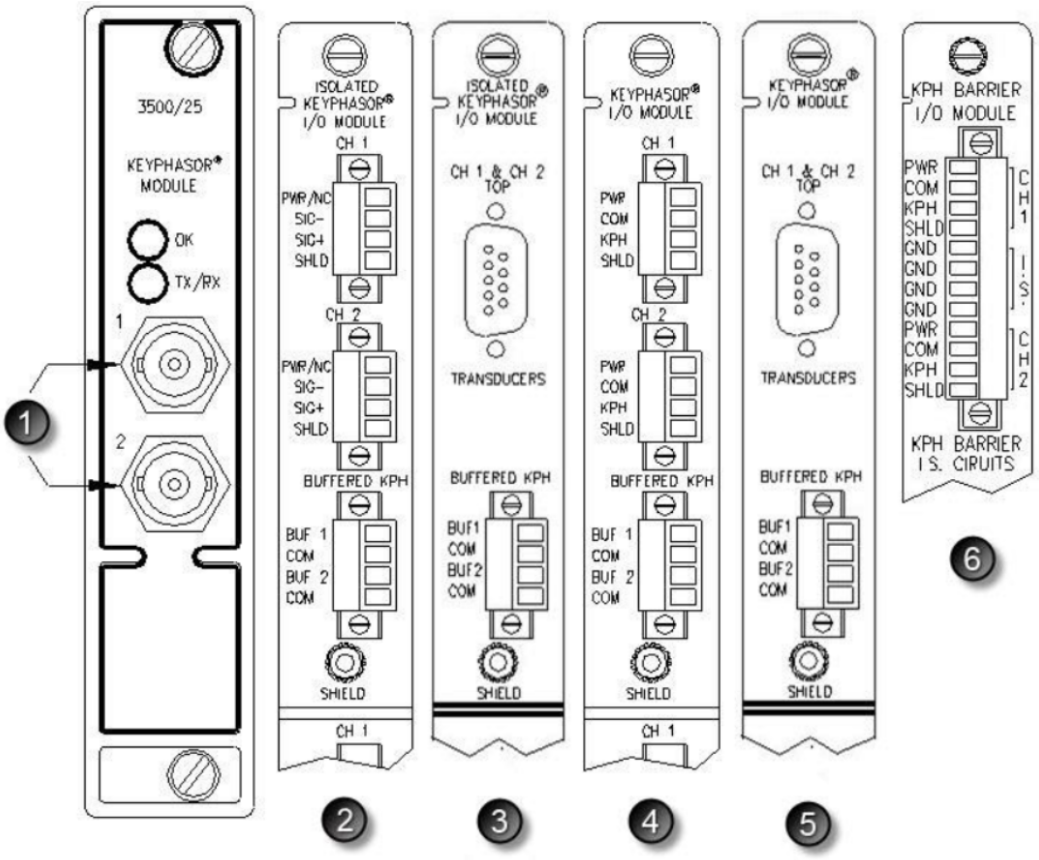


Figure 1: Phase Error vs. Machine Speed



1. Buffered Transducer Outputs
2. I/O Module, Isolated Internal Termination
3. I/O Module, Isolated External Termination
4. I/O Module, Non-Isolated Internal Termination
5. I/O Module, Non-Isolated External Termination
6. Barrier I/O Module, Internal Termination

Figure 2: Front and Rear View of 3500/25 Keyphasor module

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