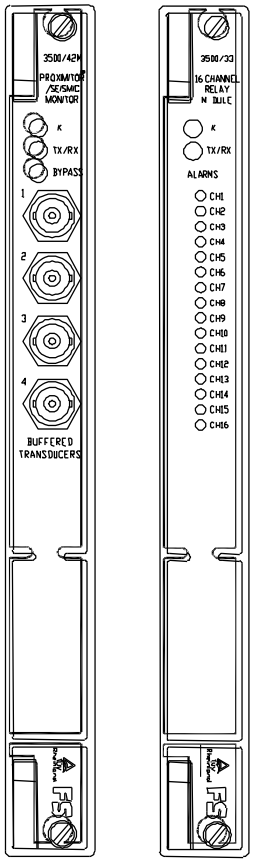
3500 Machinery Protection system: Functional Safety Certified Products

Bently Nevada* Asset Condition Monitoring



Description

Functional Safety (FS) offerings provide enhancement to safety with ability to automatically initiate shutdown of critical production machinery by detecting system characteristics that precede hazardous failure. More specifically, these offerings help operating facilities achieve compliance with IEC 61508. TÜV Rheinland has evaluated Bently Nevada* functional safety products and certified their use to given Safety Integrity Levels (SIL).

Applications that are currently supported by our products include Overspeed Detection, Radial Vibration, Thrust Position, Case Vibration, Temperature and Process Variable Input.

An FS version of 3500/53 three-module Overspeed Detection System provides instrumentation for Overspeed shutdown at SIL 3. This offering is triple modular redundant (TMR) that votes in a 2-out-of-3-shutdown scheme or may be selected to provide independent voting. Each I/O module provides four built-in relays, where one is dedicated to Overspeed conditions. The remaining three relays can be configured to respond to any available Overspeed module values and events, including 'Not OK'. Operation of the relays specifies for no more than 30ms of delay from Overspeed event to relay activation.

FS versions of the 3500/42M or 3500/40M in a Discrete TMR group address SIL 3 safety functions using Radial Vibration and Thrust Position. These vote in a 2-out-of-3 scheme. Each system consists of a set of 3500/42M or 3500/40M monitors, accompanied by a 3500/34 TMR Relay Module. Relay actuation can be configured for direct amplitude proportional values in logical combinations using the 3500/34 TMR Relay Module. Each 3500/34 TMR Relay I/O module provides four built-in relays.

FS versions of 3500/42M and 3500/40M systems for Radial Vibration, Thrust Position, and Case Vibration provide compatibility with SIL 1 safety functions monitoring these characteristics (direct amplitude only). These systems consist of a single monitor card, an FS 3500/32 Four Channel or 3500/33 Sixteen Channel Relay cards, and transducer.

FS versions of 3500/60 and 3500/61 systems provide SIL 1 compatibility for safety functions using temperature monitoring. A single monitor card using six RTD or TC sensors with an FS version of 3500/32 or 3500/33 Relay card makes a sensor-logic part of a temperature based safety function. FS 3500/62 Process Variable monitor used with either FS relay module provides a SIL 1 compatible functional safety monitoring system where sensor input is 4-20mA or -/+10Vdc.

FS 3500/53 Overspeed Detection, 3500/42M RV/Thrust, and 3500/40M RV/Thrust certified systems are specified for use with the 3300XL Proximitor* and 3300 Series Proximity Probes (with SIL 1 and SIL 3). A magnetic pick-up sensor is available to those that prefer this sensor type for Overspeed. The 330500 and 330525 Velomitor* Piezo-velocity Sensors are available for use with FS 3500/42M systems certified as compatible with SIL 1 safety functions.

Conditions of Use

The following are requirements and recommendations for Functional Safety products to be applied to the configuration and installation of Functional Safety Certified systems.

Requirements

- Only those components contained within the TUV certified configurations can be used within certified systems. Contact your local representative for details
- Dual power supplies are required
- For Overspeed the "OR Channel Not OK with Overspeed Voting" option must be selected
- For all TMR, 'Comparison Voting' must be used
- Verification of configuration – uploading rack configuration after configuration loaded and comparing to specified settings

Recommendations

- Optimization and Control Services to inspect during validation/commissioning for proper installation, configuration and usage
- One year interval for Proof Testing

Ordering Information

Options for standard monitors and functional safety monitors are selected in 3500_SYSTEM under FS_SYSTEM

Spare monitors and modules		
Monitor	**Part Number**	**Notes**
3500/32	3500/32_SIL1	
3500/33	3500/33_SIL1	
3500/40	3500/40 _SIL	For SIL 1 or 3
3500/42	3500/42 _SIL	For SIL 1 or 3
3500/53	3500/53_SIL3	
3500/60	3500/60_SIL1	
3500/61	3500/61_SIL1	
3500/62	3500/62_SIL1	

FS monitors and modules in a rack			
Monitor	**Select**	**Notes**	
3500/32	3500/32 (SIL1)		4-Channel Relay Module
3500/33	3500/33 (SIL1)		16-Channel Relay Module
3500/40	3500/40 (SIL1)	-A01-B01	Proximitor I/O Module with Internal Term.
		-A02-B01	Proximitor I/O Module with External Term.
		-A03-B01	Proximitor I/O Module with Internal Barriers and Internal Term.
3500/40	3500/40 (SIL3)	-A01-B01	For SIL 3; AA options -01, 02, 04. (See part descriptions above)
		-A02-B01	
		-A03-B01	
3500/42	3500/42 (SIL1)	-A01-B01	Prox/Seismic I/O Module with Internal Term.
		-A02-B01	Prox/Seismic I/O Module with External Term.
		-A04-B01	I/O Module with Internal Barriers (4x prox/accel ch's) and Internal Term.
		-A05-B01	I/O Module with Internal Barriers (2x prox/accl + 2x channels) and Internal Term.
		-A06-B01	I/O Module with Internal Barriers (4x Velomitor channels) and Internal Term.
		-A09-B01	Prox/Velom I/O Module with Internal Term.
3500/42	3500/42 (SIL3)	-A01-B01	For SIL 3; AA options -01, 02, 04. (See part descriptions above)
		-A02-B01	
		-A04-B01	
3500/53	3500/53 (SIL3)		Overspeed Detection System
3500/60	3500/60 (SIL1)	-A01-B01	RTD/TC Temperature I/O Module (w/o recorders, internal term)
		-A02-B01	RTD/TC Temp I/O Module (w/o recorders, external term)
3500/61	3500/61 (SIL1)	-A01-B01	RTD/TC Temp I/O Module (with recorders, internal term)
		-A02-B01	RTD/TC Temp I/O Module (with recorders, external term)
3500/62	3500/62 (SIL1)	-A01-B01	-10 to +10 Vdc I/O Module w/ Internal term.
		-A02-B01	-10 to +10 Vdc I/O Module w/ External term.
		-A03-B01	Isolated 4 to 20 mA I/O Module w/ internal term.
		-A04-B01	Isolated 4 to 20 mA I/O Module w/ external term.

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